12.5.71

S. 153A

2 JUL 1973
NATURAL HIST

# TRANSACTIONS OF THE LINCOLNSHIRE NATURALISTS' UNION

*Vol. XVII No. 4 Part 1*
*1971*

*Edited by*
*D. N. ROBINSON, M.Sc.*

*Headquarters: City and County Museum, Lincoln*

# Lincolnshire Naturalists' Union

*Founded June 12th, 1893*

## LIST OF OFFICERS, 1970-71

**President:**

Mr. H. J. Houghton

*Hon. General Secretary and Editor of Transactions:* D. N. Robinson, M.SC., 160 Eastgate, Louth. (*Tel.* 2019).

*Hon. Treasurer/Membership Secretary:* Mrs. D. J. F. Adams, 2 Rischolme Lane, Lincoln. (*Tel.* 24664).

*Hon. Joint Field Secretaries:* M. P. Gooseman, F.R.E.S., 'Lonicera', Churchside, Alkborough, Scunthorpe. (*Tel.* Burton-on-Stather 314).

G. L. A. Posnett, M.S.S.CH., M.B.CH.A., 20 Hood Street, Lincoln.

*Executive Committee:* Miss E. J. Gibbons, F.L.S., Mrs. I. Weston, B.SC., Dr. M. M. Lubin, M.S., B.S.

*Hon. Auditor:* Robert Withers, J.P., 20 Friars Lane, Lincoln.

### SECTIONAL OFFICERS

*Geology:*

*President:* Dr. P. E. Kent, D.SC., PH.D., F.R.S., F.G.S., Britannic House, Moor Lane, London, E.C.2.
*Secretary:* Prof. A. Straw, B.A., PH.D., Department of Geography, The University, Exeter.

**Botany:**

*President:* Miss G. M. Waterhouse, M.SC., 18 Cumberland Road, Kew, Richmond, Surrey.

*Phaenerogamic Botany Secretaries:* Miss E. J. Gibbons, F.L.S., The Hall, Holton-le-Moor, Lincoln.
J. H. Chandler, 43 Roman Bank, Stamford.

*Cryptogamic Botany Secretaries:* *Mycology:* H. J. Houghton, 7 Willingham Road, Lea, Gainsborough.

*Bryology and Lichenology:* M. R. D. Seaward, M.SC., M.I.BIOL., Trinity and All Saints' Colleges, Troy, Horsforth, near Leeds.

**Ornithology:**

*President:* P. J. Wilson, 'Penates', Station Road, Reepham, Lincoln.
*Secretary:* M. Johnson, F.Z.S., City and County Museum, Lincoln.

**Zoology:**

*President:* F. Norris, F.C.C.S., 120 Church Lane, Scunthorpe.

*Vertebrate Zoology Secretary:* M. Johnson, F.Z.S., City and County Museum, Lincoln.

*Invertebrate Zoology Secretaries:* *Arachnology:*

*Lepidoptera:* A. E. Smith, B.SC., 270 London Road, Wyberton, Boston.

*Economic Entomology:* B. A. Cooper, B.A., B.SC., A.R.C.S., F.R.E.S., Shardlow Hall, Shardlow, Derbys.

*Marine and Fresh Water Biology Secretary:* E. H. Clifton, Bellhouse, Newbiggin, Co. Durham.

**Optics:**

*President:* W. L. Young, B.SC., 19 Smith Street, Lincoln.

*Microscopy Secretary:*

*Photography Secretary:* G. S. Phillips, F.C.A., 71 Pearson Road, Cleethorpes.

2 JUL 1973
197
NATURAL HIST

# Presidential Address

Delivered at Lincoln on 13th March, 1971

by

H. J. HOUGHTON

## A BEGINNER'S GUIDE TO THE MYXOMYCETES

### [with special reference to Lincolnshire]

Whenever I have produced slides of myxomycetes, I have found that most naturalists show an interest, but in view of the scarcity of available material, I have been unable to recommend much bibliography, in particular of an elementary nature. In an effort to foster this interest, I propose to give a short beginners' guide to the group — its life history and macro-characteristics used for identification purposes, to mention some ideas on the collection and preservation of specimens, and to include some details of Lincolnshire collections and collectors.

Compared with other branches of natural history, we are dealing with a group of organisms which are very incompletely known, and which to date have been little studied, although interest is growing at the present time in view of the considerable scope which they offer to the 'lab.' scientist in his biological studies. Research has been recently revived in this country, as well as in Poland, the U.S.A. and Holland.

Certain species have been known for some 300 years, if only in a small way. The first to be described was *Lycogala epidendrum* by Panckov in 1654. He placed it (presumably using macro-characters only) among the gasteromycetes, and its resemblance to a puff-ball is evident when seen in close-up. Only five species had been described up to the time of Linnaeus, and he recorded them (still among the gasteromycetes) in the 'Nova Plantarum Genera' in 1753. It was not until the researches of de Bary and his successors about 1860 that it was realised that an entirely separate group of organisms was involved, with a life cycle vastly different from that of the fungi. Even then, opinions evidently varied as to their affinities, since de Bary, in two papers in 1858[1] and in 1859[2], designated them 'myxomycetes' (or slime moulds) and 'mycetozoa' (or fungus animals) respectively, whilst in 1892, Massee[3] wrote a monograph on them as the 'myxogastres' (or slime puff-balls). Today, they are generally referred to as 'myxomycetes', a name which was first applied by Link in 1833, whilst they were still classed with the fungi. The present nomenclature of the myxomycetes begins (according to the International Code) with Linnaeus, and not with Fries, who is the starting point for fungus nomenclature.

In this country at the end of the last century, the Listers began their valuable researches under the auspices of the British Museum, resulting in monographs in 1894[4], 1919[5] and 1925[6]. The last one is still a world authority, and has many excellent coloured plates by Miss G. Lister which have been unsurpassed. Copies occasionally become available on the second hand market, but they usually reach an astronomic price. Occasionally, one may come across the various editions of the British Museum 'Guide to the British Mycetozoa' from the same source. These are precis of the Lister monographs without the plates.

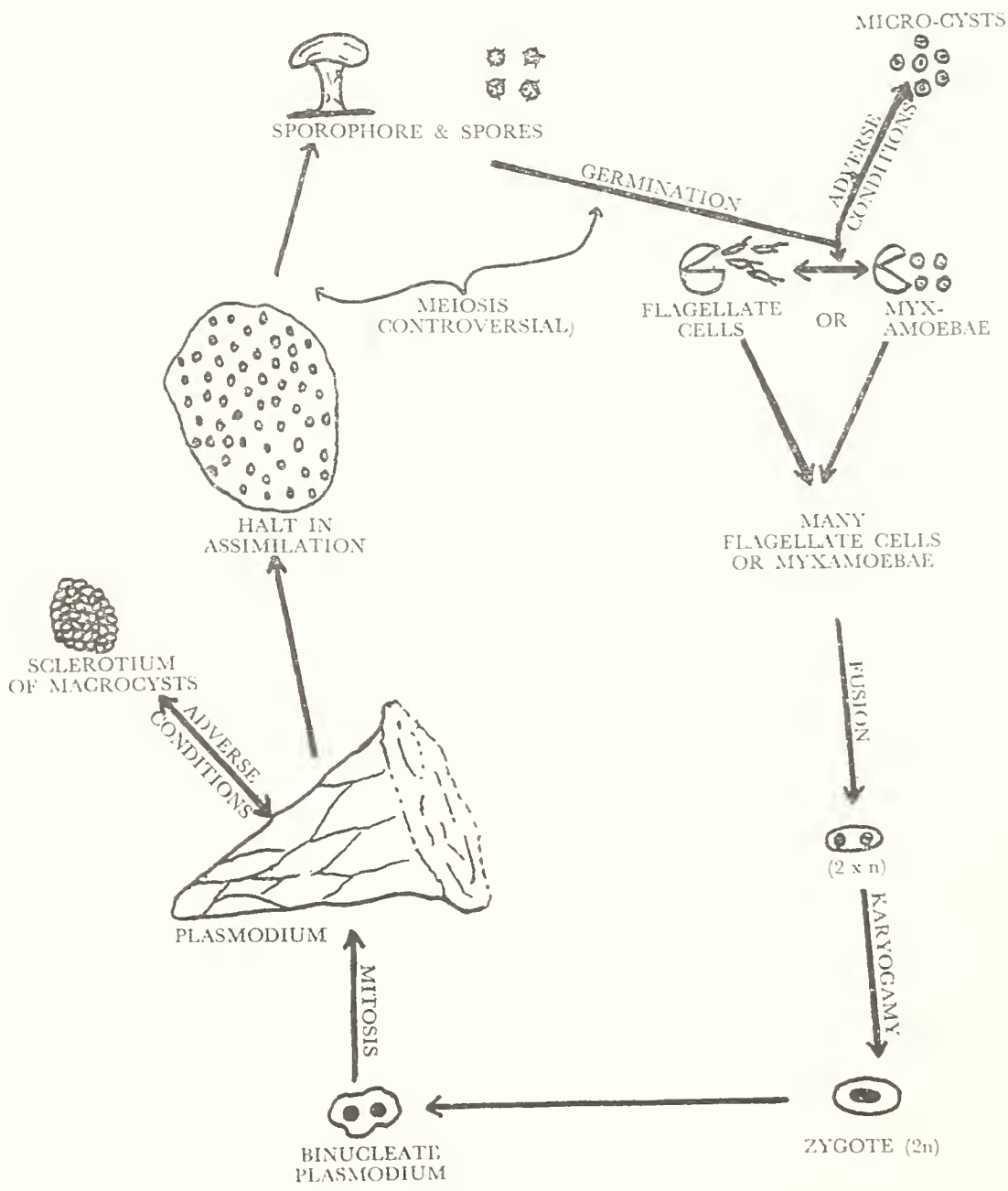
In 1949, J. W. Martin[7] monographed the group in Part 1 of the 'North American Flora' issued by the New York Botanical Garden, but here again the work is out of print and practically unobtainable. A similar state of affairs appertains with practically all other monographs. The most recent flora (which is still obtainable) is again American, and is by Martin and Alexopoulos[8]. By the time it reaches England the price is in the region of £13 and thus, excellent

as it is, it is beyond the reach of many amateur naturalists. There is no British flora available at the moment to my knowledge, but it is hoped that one will be appearing shortly.

Now let us briefly consider the biological angle. Even to-day opinions are divided as to the affinities of the group coming, as it does, close to the division between the animal and the vegetable kingdoms. Species exhibit characteristics along both lines, and zoologists tend to claim them as allied to the Protozoa in view of the amoeboid part of the life cycle, whilst botanists claim them as allied to the spore producing plants such as the fungi. If anyone would care to pursue the matter further, there is an excellent discussion, with a very extensive bibliography, in Gray and Alexopoulos' 'Biology of the Myxomycetes'[9].

In considering the question of what the myxomycetes are, it is generally accepted that they conform to the following requirements. They are organisms which have an assimilative, or feeding stage, which is multi-nucleate and non-cellular and which consists of a motile, free-living mass of protoplasm (called the plasmodium), and a fruiting, or sporophore stage similar to that of some of the cryptogams in which a mass of mononucleate spores (occasionally they may have a small number of nuclei each) are produced in a membranous, non-cellular sporophore. This is perhaps an over-simplification, but it will serve our present purpose.

## GENERALISED LIFE CYCLE OF A MYXOMYCETE



**Life cycle of the myxomycetes**

An explanation of the fore-going definition may perhaps be gained from the generalised life cycle given in Diagram I. Commencing with the sporophore and spores, on germination the latter each produces up to four myxamoebae or flagellate swarm cells, rather after the style of a chicken bursting from an egg, as opposed to the process of germination as in many fungi by the growth of a hyphal tip. Under some circumstances, and in some species, one can induce flagellate bodies to transform to non-flagellate amoeboid bodies and vice versa (Gray and Alexopoulos[9]). Under adverse conditions such as cold or drying out, these micro-organisms can form micro-cysts analagous to *Amoeba proteus*, and this process is reversible when favourable conditions return. The swarm cells, as they are termed, now divide many times asexually to give many individual mono-nucleate cells. At a certain point, compatible cells pair off and fuse, first in the protoplasm and then in the nuclei, to give many mononucleate zygotes. After possible fusion (or even cannibalisation in some cases) of the resultant cells, the nucleus in each zygote divides by mitosis, becoming a bi-nucleate cell, and initiating the assimilative phase. As the ingestion of food progresses, the nucleus in each case successively divides without division of the protoplasm and so the plasmodium, which we can see in numerous cases with the naked eye, is formed. Again at this stage, under adverse conditions, the protoplasm will transform to a resting state in the form of a sclerotium or macro-cyst, in this case multi-nuclear, and again the transformation is reversible under favourable conditions. At some apparently indeterminate point (possibly when the food supply is exhausted) the plasmodium stops feeding and commences to cleave into mono-nucleate cells again. These become spores, and are formed usually within a peridium, thus completing the life cycle from spore to spore. A sex process occurs, but precisely where is at the present time controversial. Meiosis is thought to occur somewhere between cleavage and the germination of the spores, the particular point depending on species.

The amoeboid or the flagellate phase is thus allied to the protozoa, as is the power to form cysts in adverse conditions, but the sporophore and spore formation is allied to the fungi. The multi-nucleate cell stage is unlike the animal kingdom, but being amoeboid in form and motile is more like the animal kingdom than the plants.

**Differences from some similar groups**

From the definition already given and the preceding life-cycle, the differences from some similar groups are evident as follows:

(*a*) The life cycle involves a sexual process, and the assimilative phase is a true multi-nuclear plasmodium and not cellular, unlike the *Acrasiales*[10].

(*b*) Myxomycetes are always saprophytic and lack a haploid plasmodium and a zoosporangial stage in the life-cycle. This serves to differentiate them from the *Plasmodiophorales*[11], the group responsible for club-root disease in Brassicae.

(*c*) The saprophytic habit, multi-nucleate plasmodium, the non-production of certain spindle-shaped cells gliding on a net differentiate the myxomycetes from the *Layrinthulales*[12], the organisms responsible for the wasting disease of eelgrass on our coasts.

(*d*) They differ from the *Protostelida*, a group first monographed by L. S. Olive in 1967[13] in that the plasmodium in the latter is reticulate and there is no evidence of a sexual process in its life cycle.

Up to the present time, some 55 species from a total of 425 known in the world have been cultivated in the laboratory from spore to spore (Gray and Alexopoulos 1968, p. 218). Now since spores are viable in the herbarium in many cases for limited periods only, fresh 'wild' specimens will be needed before complete coverage is accomplished and culture collections organised. We can help, therefore, as field naturalists in providing these specimens. As far as my own collections are concerned, I have germinated *Fuligo septica*, *Physarum nutans*, *Trichia varia* and a few other species at periods up to six years after collection. Other species may have a much shorter herbarium life, but very little serious research has been carried out into the longevity of spores in the herbarium, and ideal storage conditions will, of course, take time to determine.

So much for the biological side — it is necessarily sketchy, but it will serve as an introduction for anyone wishing to go further.

## Macro-details and types of spore bodies found in the field

In the field, one meets the myxomycetes either in the plasmodium or in the sporophore stage. It is practically impossible according to our present state of knowledge to identify specimens in the plasmodium stage, and we will return to this later. Considering the sporophores, they are found in a variety of forms, shapes and sizes, and their macro-details, combined with micro-details of the spores, capillitium, etc., are used for taxonomic purposes.

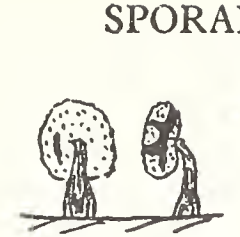
Of the fruiting bodies themselves, some of the common forms to be found in Lincolnshire are shown in Diagram 2. Apart from Ceratiomyxa, which we shall discuss later, there are four types of fruiting bodies. They are called the SPORANGIUM, the PLASMODIOCARP, the AETHALIUM and the PSEUDO-AETHALIUM, the salient points of each type being as follows:

Sporangia are usually of the order $\frac{1}{2}$ to 2 mm in diameter. They may be stalked (as in *Comatricha typhoides*) or sessile (as sometimes in *Trichia varia*) and may have a peridium which is limey (as in *Physarum nutans*), membranous and without lime (as in *Trichia varia*) or net-like (as in *Comatricha nigra*). The stalk may be produced into a columella as in Diagram 2, which in turn may give rise to the capillitium, as a mass of hair-like, limey or hyaline tubes or threads, and among this the spores come to fruition. The capillitium is often somewhat similar to that of the puff-balls from a macroscopic point of view and hence, no doubt, in part arose the classification with the gasteromycetes in the early days before the general use of the microscope.

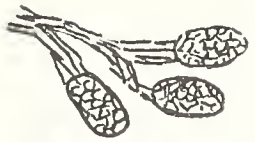
The construction of the capillitium and spores of some common genera as seen under the microscope are shown in Diagram 3. Spores are of the order 10 microns in diameter, and are usually sperical or subspherical. They may be smooth, spiny, warted or reticulate. The capillitium also may have varied ornamentation, and its threads are usually from 1 to 5 microns in diameter. These threads, or elators, may be in short lengths or long lengths, or they may comprise a repeatedly bifurcated and anastomosed network. They may have lime in parts, or may be wholly composed of lime, or they may be lime-less. Wherever found, the lime is a form of calcium carbonate and thus, if a mineral acid is added to it, it fizzes giving off carbon dioxide.

All the foregoing details are used for classification and identification of both genera and species. Some idea of the macro-details will perhaps be better given by details of some of the specimens I have collected, mainly in and around Lincolnshire.

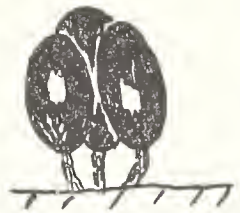
## SPORANGIA (x 10)



PHYSARUM NUTANS



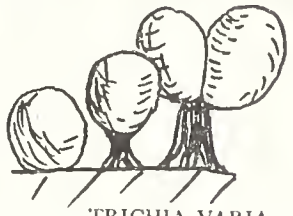
BADHAMIA UTRICULARIS



LEOCARPUS FRAGILIS

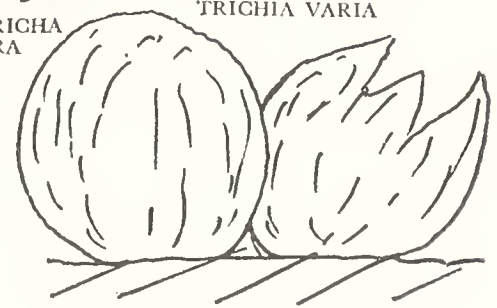
COMATRICHA TYPHOIDES

COMATRICHA NIGRA



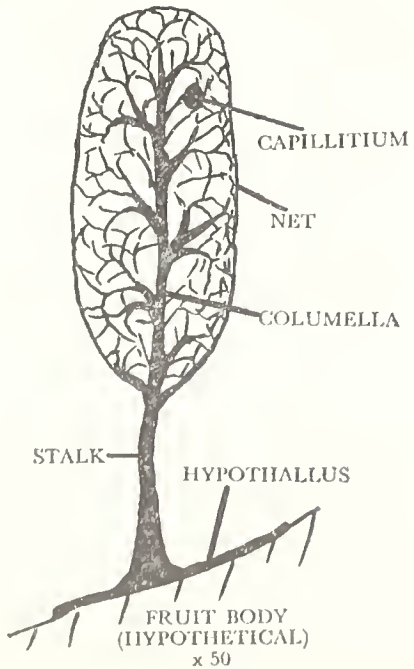
TRICHIA VARIA

PSEUDO-AETHALIUM (x 10)
(TUBULINA FERRUGINOSA)



LYCOGALA EPIDENDRUM

## AETHALIA (x 4)

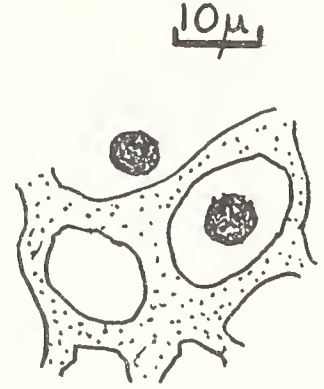



FRUIT BODY
(HYPOTHETICAL)
x 50

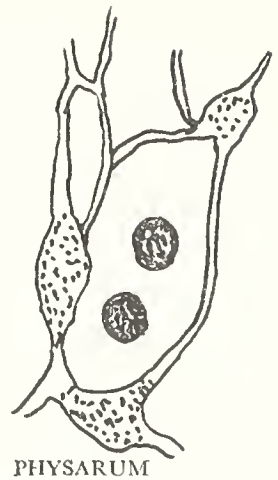
AMAUROCHAETE FULIGINOSA

# SPOROPHORES

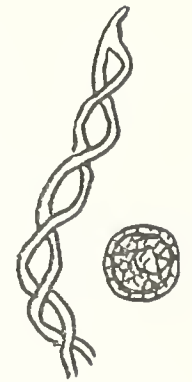
# CAPILLITIUM




BADHAMIA

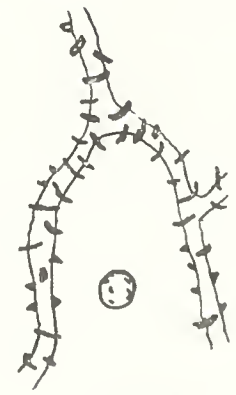


PHYSARUM

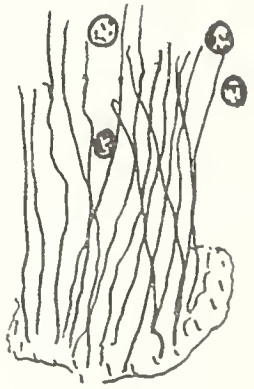


TRICHIA

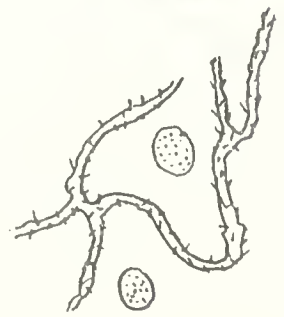
RETICULARIA



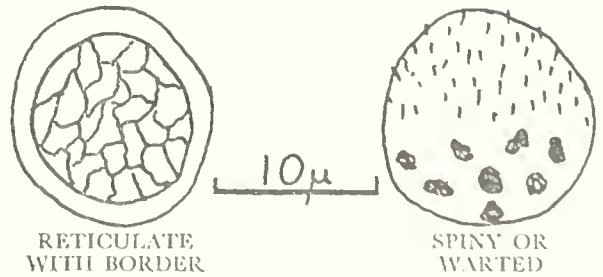
ARCYRIA



DIDYMIUM



PERICHAENA




RETICULATE
WITH BORDER

SPINY OR
WARTED

# SPORES

1. *Trichia varia.* This limeless species, the sporangium of which is approximately 1 mm in diameter, is sessile (or sometimes stalked), has an ochre coloured membranous peridium and ochre coloured spores. It is very common on dead wood, stumps in particular, in Lincolnshire, and is in fact a very cosmopolitan species.

2. *Comatricha typhoides.* This species has a long cylindrical sporangium up to 1 mm in diameter mounted on a black stalk and is approximately 10 mm high. The sporangia are sheathed initially in a rather evanescent membrane and are caespitose on a membranous hypothallus, or basal membrane. The capillitium forms a network in which brownish black spores are produced. This is again a lime-less species and, at about 30 to 40 times magnification, one can follow the continuation of the stalk to form a columella, which in turn forms the capillitium and surface net as in Diagram 2. The species is common in Lincolnshire.

3. *Comatricha nigra.* This is a species from the same genus as the last, but it has a very different aspect. It has a very long, black stalk, up to 10 mm high, and a dark brown spherical sporophore about $\frac{1}{2}$ mm diameter seated on the top. Its fruiting bodies grow singly, well separated. I have found this species at Woodhall Spa, Laughton Common and a number of other locations in the County.

4. *Arcyria nutans.* This species is not stalked. When first formed, the sporangia are more or less spherical and about 1 to 2 mm diameter, and are contained in an evanescent peridium. The capillitium soon expands, bursting through the peridium, to form a minute loofah-like object, which is bright yellow, and can be up to 10 mm long. It is usually caespitose on dead wood (I have found it particularly on Birch). In this case the capillitium is distinctively ornamented with cogs and rings when examined under the microscope. I have found both this and the following species in many Lincolnshire locations.

5. *Arcyria denudata.* This species, which is fairly common in Lincolnshire in summer and autumn, also has a distinctively ornamented capillitium (as seen sub. mic.) but has crimson spores and capillitium. It is a species which is fairly easy to recognise in the field, with its black stalk and crimson capillitium firmly attached to the cup left by the peridium.

6. *Badhamia foliicola.* Here we have a very different species. The sporangium, which is about 1 to 2 mm in diameter, has lime in the peridium, and its capillitium is formed of lime tubes. I have found it in Langholme Wood in the Isle of Axeholme, and in Tumby Woods.

7. *Craterium minutum.* Fruiting bodies of this tiny species were found on living bramble leaves during the Union fungus foray in Welton Woods in 1970. Typical of *Craterium*, it is stalked, and the sporophore forms a deep cup at the top. The whole is about $\frac{3}{4}$ mm high. Dehiscence is by way of a definite lid on the sporangium cup. The capillitium has white lime knots, which are crystalline, and which tend to aggregate at the centre of the sporangium to form a pseudocolumella.

8. *Physarum nutans.* This species also has a white, stalked sporangium and is up to 5 mm high. The lens-shaped sporangia appear to 'nod' at the top of the stalk, and the limey peridium is often torn into squamule-like shreds. The capillitium is of hyaline threads with lime knots at the nodes. I have found it at Woodhall Spa, Laughton and many other Lincolnshire locations.

9. *Leocarpus fragilis.* Yet another species with lime in the peridium (only). The reddish-brown surface of the peridium appears to have been varnished, and in this case, the lime is underneath in a second layer. The oval sporophores are up to 3 mm long. At the Welton Wood foray last year we came across large

quantities of this species on the forest floor debris in a recently felled area, and in this case it was in the form of the plasmodium, which was in the process of transforming to the sporophores.

10. *Badhamia utricularis*. Extensive work was done on this species by the Listers about the turn of the last century, and it is figured in their monographs. Consequently it has quite often been used as a 'text-book' species. It is not so common (at least, not in Lincolnshire) as one would be led to believe. It has stalks forming straw-like connectors between the sporangia, which are about 4 mm long, and are dark bluish, with lime in all parts. It forms an easily cultivated yellowish plasmodium, in which one can observe the veins behind the 'feeding front', and the rhythmic 'streaming' of the protoplasm. It will even thrive in cultivation on corn flakes! I have found it in Fiskerton Long Wood and at Tumby.

11. *Cribraria argillacea*. In *Cribraria* there is little, if any, capillitium, and the peridium is evanescent, leaving behind a net on the surface enclosing the spores. I found it on the Trust's Wilsford Heath Quarry reserve last year. It is usually sessile, and the limeless sporangia are $\frac{3}{4}$ mm diameter, and darkish yellow.

12. *Cribraria rufa*. Here we have a stalked species about ·2 to ·3 mm in diameter. Unlike the previous species, its rusty coloured sporophores are produced singly and well separated. It was found at Hartsholme last year on some long dead decorticated wood.

Now returning to *Arcyria nutans*, it was mentioned that the sporangia are sessile, long, and have a bright yellow capillitium and spores. Comparing it with

13. *Arcyria pomiformis*. The sporangia of *A. nutans* are sessile, long and have a bright yellow capillitium and spores. Comparing it with *A. pomiformis*, which I have found on decorticated rotten wood in Norfolk, the latter is also yellow, but the capillitium does not expand to the loofah-like object as does *A. nutans*, but the sporangia are rather pear shaped. It is stalked, and the peridium leaves a definite cup at the top of the stalk with the base of the capillitium firmly fixed inside it.

14. *Arcyria ferruginea*. This species, however, which was found in the Lincoln district last year, has a ferruginous yellow colour, but one always finds a greenish tint somewhere in the expanded capillitium, where it is faded due to the shedding of the spores.

15. *Perichaena corticalis*. *Perichaena* is another limeless genus, whose species often dehisce by a lid which is easily visible in most species. *P. corticalis* is sessile, and the surface of the peridium appears felt-like under a magnifier. I have found it at Burton Stather, Laughton, Tumby and several other locations in the County.

16. *Perichaena depressa*. This species, in the same genus as the last, is quite common in Lincolnshire on dead branches of deciduous trees and even on fencing poles when not decorticated. The sporangia are about 1 mm in diameter, are sessile, and are crowded together to such an extent as to make them angular. As the orange coloured 'lid' comes off, the deep yellow spores are revealed in mass.

So far, the only fruiting body type considered has been the sporangium. The other three types mentioned previously follow on as developments of this type, as can now be seen.

17. *Didymium squamulosum*. Returning to the calcareous genera again, the genus *Didymium* has crystalline lime in the peridium and/or stalk only. A specimen of *D. squamulosum* from Great West Wood last year had lime in the stalk only. Now in *D. squamulosum* and *D. melanospermum*, one can often see

signs of the individual sporangia coalescing together into sausage-shaped bodies among the spherical simple sporangia. Here we have the beginnings of the second type of fruiting body, namely the PLASMODIOCARP.

18. *Physarum cinereum*. This species, which can have simple spherical sporangia, in my experience more often forms these plasmodiocarps. A specimen collected in Tumby Woods from a sawdust heap consisted almost wholly of bodies in which three or four sporangia had coalesced to form sausage-like strings.

Going one stage further, we come to one of the commonest species in Lincolnshire, namely

19. *Lycogala epidendrum*. Here, the individual sporangia have entirely lost their identity, and several have merged to form a much larger body, which is in this case almost spherical. Here we have one form of the AETHALIUM. The individual aethalia in this species can be up to 1 cm in diameter, and it is evident how, before the general use of microscopic characters, the macro-appearance of the mature fruiting bodies of this species led to its classification with the gasteromycetes, despite its pink spores. It is of very similar form, and dehisces by stellate splits in the top of the fruiting body, as do several of the puff-balls.

20. *Fuligo septica*. Here we have a rather amorphous looking shapeless mass with a usually yellow, limey peridium, and dark purple spores. One specimen I found at Laughton last year was the largest I have seen, covering nearly the whole of the base of a fair sized conifer, and being about 30 cm across. In that case it was yellow, but it can be greyish, as in the case of a specimen I found on the stump of a horse-chestnut tree in Lea. A peculiarity of this species is that when allowed to fruit from the plasmodium stage in a tin or in a petri-dish, it often produces grey or even white aethalia (possibly due to the fact that light is essential for formation of the yellow form). To show the variation in size of this species, I collected a specimen of *F. septica* on Laughton Common this year which was less than two centimetres across, and was much more regular in shape. In all the specimens mentioned of this species, the small individual sporangia have lost their individual identities, and merged to form larger AETHALIA, and have amorphous lime in the peridium.

21. *Reticularia lycoperdon*. This is another aethalioid species which is very variable in size. I found one specimen fruiting on a live willow tree in the Isle of Axeholme which was 8 or 9 cm across, but another from Laughton Common was only $1\frac{1}{2}$ cm across. In this species, there is no lime in its make-up, the spores are dark coloured, and it has a very tender white or grey membranous peridium. The larger specimens of this species I have found very difficult to preserve, since at the slightest suspicion of damp, moulds attack the peridium severely, producing excellent crops of conidia of fungi imperfecti. *R. lycoperdon* is common on living and dead tree trunks in Lincolnshire in the spring and summer.

22. *Amaurochaete fuliginosa*. This wholly black species, another aethalioid one, can often be found on the sawn-off stumps of conifers in the forest within a year or so of felling. It has a black, very tender peridium, containing a mass of black spores.

23. *A. cribrosa*. Occasionally one may come across specimens of this rare species, which appears similar to the last, but is a rather warmer black or dark brown. Its habitat is logs and trunks of recently sawn-off pines and specimens were found (as a mass of pink slime — the plasmodium) at the South Humberside Group's foray in Swallow Vale Wood in 1969. This species is characterised by a hyaline network of threads running through the spores, and this is visible at a magnification of X20. *A. fuliginosa* does not have such a network.

24. *Tubifera ferruginosa.* In *Stemonitis* the fruiting bodies take the form of numerous stalked and separate sporangia, grouped on a common membranous base, or hypothallus. In *T. ferruginosa*, however, the walls of the separate sporangia are fused together, and although the individual walls can be traced, as in a honeycomb, they cannot be separated. Here we have the last of the types of fruiting bodies, namely the PSEUDO-AETHALIUM. The fruiting bodies resemble the form of, say, the cushion shaped aethalia of *Amaurochaete*, but the individual sporangial walls can be picked out and seen in section with the naked eye.

25. *Ceratiomyxa fruticulosa.* The only other type of fruiting body has spores seated directly on projections from its hypothallus. The white *C. fruticulosa* is the only species found in this group, the Exosporae, in Great Britain. It is quite common at Woodhall Spa Woods, and I have found it at several other locations in the County. It could be looked upon as forming the smallest possible sporangium, namely that of the single spore, but perhaps it is as well to stick to the text-books and class the species as 'exo-spored'.

**Identification of specimens**

For application of the details I have illustrated, an excellent key to the British myxomycetes down to genus level has been worked out by Ing[14]. There is no key available, to my knowledge, down to species level. There is available, however, a catalogue of the species known in the British Isles[15].

**Habitats**

The majority of myxomycetes cannot be identified with certainty in the field, since microscopic details are needed. It is thus necessary to make collections. Fortunately there is no evidence that collection of specimens in any way tends to reduce noticeably the number of specimens extant, unlike the case of the higher plants.

When searching for the fungi, at most seasons one can be sure of collecting a basketful of specimens on a walk through the woods, but this is not so with the myxomycetes. At our fungus foray, we have become accustomed to collecting in the region of 100 species of fungi in an afternoon, but a good 'bag' for an afternoon's collecting of myxomycetes would be six or eight, with 12 as an excellent haul. There are, of course, some habitats which prove more rewarding than others, but I have had specimens turn up in the oddest situations. A specimen of *Mucilago spongiosa* occurred in long grass on Laughton Common within a foot or so of the tarmac road. I have had *Reticularia lycoperdon* appear on a fence in my garden and, whilst on holiday last year, I came across a specimen of *Physarum nutans* amongst moss and lichens some six feet up a living tree in the centre of Salzburg.

Any dead wood in a damp situation can provide specimens, as can any rotting vegetation. Fallen branches or trunks amongst damp leaf litter are often prolific, as was one moss covered trunk at the South Humberside Group foray at Benniworth Haven. It was covered in large areas by a blue plasmodium which was just starting to fruit. Unfortunately moulds took over in this case before identification could be made.

The debris under holly trees has its own flora, usually on the underside of the top leaves, and old sawdust heaps in woods and sawmills are well worth searching. We found excellent specimens of *Leocarpus fragilis* on the outside of a paper sack filled with sawdust when we had the Union foray in Tumby Woods a few years ago. Pine needle carpets and other leaf litter are excellent substrates, and one can often see the plasmodium or aethalia of *Fuligo septica* in such a situation on pine needles. Even turf near to melting snow at high altitudes is said to have its flora.

To quote a few more habitats found in Lincolnshire, one may give the following examples:

26. *Trichia varia.* A specimen was found on the Trust's reserve at Burton Pits last autumn on very rotten and highly water impregnated 'touchwood'.

27. *Trichia botrytis.* Some specimens were found on much dryer dead wood at Roxton Wood.

28. *Stemonitis axifera.* This species was found in quantity on conifer sawdust heaps in Laughton Forest. It appeared as the white plasmodium, and one was able to follow the progression through pink to red and then to brown as the sporophores matured.

29. *Leocarpus fragilis.* Sometimes one finds a bright yellow plasmodium 'crawling' on grasses in woods, or on leaf litter on the forest floor. I collected such a specimen, again from Laughton Common, which fruited to form sporophores of *Leocarpus fragilis.*

30. *Physarum nutans.* I have found this species fruiting on oak leaf litter on the floor in Woodhall Spa woods, as well as on live grass and inside dead stumps of trees.

31. *Tubifera ferruginosa.* A specimen of the plasmodium of this species which was just beginning to cleave was found on a very low beech stump near Sheringham a few years ago, whilst on holiday. Before we had returned to Gainsborough the pink plasmodium had fruited to form the brown sporophere of *Tubifera ferruginosa.*

As to the time when one should seek myxomycetes, there does not seem to be a 'close season', and one may look for them at any time of the year. I have found specimens in high summer, and at a foray in Hertfordshire in March of last year, we found a dozen or more species despite snow still lying on the ground.

**Fieldwork**

Now for a brief word about the mechanics of collecting. It must be emphasised at the outset that the myxomycetes at all stages are very tender and fragile, and it is therefore necessary to handle and transport them with very great care. Every collector has his own pet methods, but a very convenient arrangement which I use calls for the use of empty tobacco tins of the 1 lb. size fitted with thin cork liners as collection boxes. One can fix the specimens as collected on to the cork by means of glass headed pins of the type used for aero-modelling.

The tools for use in collecting are not many or bulky, and consist of a small saw (of the junior hacksaw type), a strong sharp knife and a pair of forceps. A pair of scissors can also come in useful for trimming unwanted herbage. However, even then the mechanical shock of detaching a plasmodium with a piece of substrate is often too much, resulting in a dead mass of jelly. If photography is intended, a large piece of substrate should be included with the specimen, which is taken back to the 'lab.'. My particular interest lies in photographic recording, and of course conditions as to lighting and weather are under far better control in the lab. than in the field. In any case, one brings the habitat home with the specimen, so one cannot be accused of 'faking'.

The cork liner of the tin should be faced with white paper, thus making it easy to identify the specimen with a number. Then, if the collection is to be of any use, one should record such details as

(1) By whom found.
(2) Location of find.
(3) Vice County number and County division (we have not yet progressed to 10 Km square recording).
(4) Type of habitat or substrate.
(5) Date of collection, and
(6) Any other relevant details.

On arrival home, if the specimen is a plasmodium, it is better to allow the tin containing it to stand with its lid slightly raised until fruiting has finished. The slightly raised lid helps to prevent moulds from forming by circulation of air without allowing the specimen to dry out too quickly but, even so, many specimens are ruined by moulds taking over. If one allows fruiting to take place in the field before collection it is infinitely preferable, and this course can often be followed after taking suitable precautions to prevent damage by weather.

Having identified the specimen, all that is necessary for preservation purposes is to dry it off in mild warmth (say on the top of the television set overnight!). Overheating is to be avoided at this stage, since spores are rapidly killed by heat, whereas they are well able to withstand cold and dryness.

In view of the fragile nature of the specimens, perhaps the best method of storage is to glue them on to small herbarium cards, which can be kept individually in small plastic boxes (or even match-boxes). It is perhaps superfluous to mention a means for easy location in the herbarium, but it is surprising how many amateur collections are kept in a glorious chaos.

In order to prevent mites from destroying the collection, leaving empty peridia, it is advisable to use some form of fumigation and insect repellant. The usual cherry laurel box or cyanide bottle of the entomologist can be used here with success to destroy pests in the early stages, and there are numerous proprietary insect repellants which can be used in the herbarium. PDCB should not be used, however, since it is found that this substance will kill spores in a short time and render them useless for any future cultural requirements. Tractor Vapourising Oil (not, however, paraffin) can be used with success if one can obtain it.

## Lincolnshire Collectors and Collections

As will be seen later, the County has been very little worked in the main. The first records known were quoted by C. F. Lees in the 'Victoria History of Lincolnshire', and comprised five species only. In the early part of this century before the First World War, Sir Henry Hawley added many records, in particular round the Tumby area. Some of his specimens were identified by the Listers themselves, and his myxomycete herbarium is now at the British Museum (Nat. Hist.).

From 1909 until 1925 there is a gap in the records, and at the latter date the Union was supplied with a list of identifications, mainly from the north of the County, by a well-known member of the British Mycological Society, W. N. Cheesman[16]. There was then a further gap until Miss G. M. Waterhouse started recording in the County and, from the 1940s to date, we have her to thank for numerous records, often from Union meetings and forays.

A further number of records, particularly from the south-east part of the County, were added early in the 1960s by S. S. Bates of Boston and I have him and Miss Waterhouse to thank for arousing my own interest in the subject. As a result, I have been able to add a few records to the list.

In May, 1970, we were fortunate from a recording point of view in that the British Mycological Society held their Spring Foray based on Lincoln, and present at the meeting were P. C. Holland and S. Carter, both specialists in the myxomycete field. They identified a further batch of records which are mentioned elsewhere in *Transactions*.

At the present time, whilst a number of members have shown a passing interest in the group, there are a very few of us who are making an effort to remedy to some extent the shortage of records of even the commonest species, and to obtain an overall picture. If my efforts should have the effect of furthering any such passing interest, we will, of course, be pleased to give what assistance we can.

Included as an appendix is a list of the myxomycetes recorded in Lincolnshire up to the end of 1970[17], from which it will be all too plain that it cannot by any stretch of the imagination be classed as a complete flora. It does, however, serve to show that collections have been made in some areas to a much greater extent than in others, and that it will be some time before we shall be in a position to produce a 'Lincolnshire Flora of the Myxomycetes'.

Finally, I must give due acknowledgement and thanks to certain people without whose help this address would have been difficult. Mr. S. S. Bates, of Boston, first aroused my interest in the group and identified some of the species to which I have referred. Miss G. M. Waterhouse has always been ready with advice and help over a number of years. Mr. B. Ing and Mr. P. C. Holland, both of the British Mycological Society, have identified a number of the species I illustrated and have given advice and assistance in connection with the myxomycetes generally. To these in particular, and to the many members of the Union who have sent me specimens, I must express my sincere thanks, and last, but not least, I must acknowledge the help given by my wife in putting up with my eccentricities. She does not complain (well, not much) when she finds tins of myxomycetes drying off on the television.

**References**

(1) DE BARY, A. (1858). "Ueber die Myxomyceten." *Bot. Zeit.* 16.
(2) DE BARY, A. (1859). "Die Mycetozoen." *Zeit. Wiss. Zool.* 10.
(3) MASSEE, G. (1892). *A Monograph on the Myxogastres*. London.
(4) LISTER, A. (1894). *A Monograph of the Mycetozoa*. British Museum.
(5) LISTER, A. (1919). *A Monograph of the Mycetozoa*. (2nd Edn.). British Museum.
(6) LISTER, A. (1925). *A Monograph of the Mycetozoa*. (3rd Edn.) (Revised by G. Lister). British Museum.
(7) MARTIN, J. W. (1949). *The Myxomycetes*. North American Flora 1. Part 1. New York Botanical Gardens.
(8) MARTIN, J. W. and ALEXOPOULOS, C. J. *The Myxomycetes*. 1969. University of Iowa Press, U.S.A.
(9) GRAY, W. D. and ALEXOPOULOS, C. J. (1968). *Biology of the Myxomycetes*. New York.
(10) BONNER, J. T. (1967). *The Cellular Slime Moulds*. Edn. 2. Princeton Univeristy Press, U.S.A.
(11) KARLING, J. S. (1968). *The Plasmodiophorales*. 2nd Revised Edition. Hafer Publishing Co., New York and London.
(12) DANGEARD, P. (1932). *Le Botaniste*. 24.
(13) OLIVE, L. S. (1967). "The Protostelida." *Mycologia* LIX, 1 — 29.
(14) ING, B. (1965). "An Introduction to the study of Myxomycetes." *British Mycological Society News Bulletin* Summer 1965, pp. 13 — 21.
(15) ING, B. (1968). "Census Catalogue of the British Myxomycetes." *Pub. Foray Committee of the British Mycological Society*.
(16) CHEESMAN, W. N. (1925). *List of Lincolnshire Fungi*. Unpublished.
(17) Lincolnshire Fungus Records of the Lincolnshire Naturalists Union. Unpublished.

## Appendix

### Lincolnshire myxomycetes

The following list of records is complete up to December 31st, 1970, and is taken from the (as yet unpublished) Lincolnshire Nautralists' Union mycology records.

The Vice-County number is shown in each case, with the exception of those species recorded by C. F. Lees in the *Victoria History of Lincolnshire*, where no particular district was given. In certain cases, only the vice-county number was recorded, and no county Division was given.

| | *V.C. No.* | *Division* |
|---|---|---|
| **Ceratiomyxales** | | |
| *Ceratiomyxa fruticulosa* | 54 | 2, 7 and 10 |
| **Liceales** | | |
| *Licea tenera* | 54 | 2 |
| *minima* | 53 | |
| *variabilis* | 53 | |
| *Tubifera ferruginosa* | 53, 54 | 1, 2, 5, 8, 10, 13, 15 |
| *Lycogala epidendrum* | 53, 54 | 1 — 5, 7, 8, 10, 11, 13 |
| *Dictydiaethalium plumbeum* | 54 | 10 |
| *Reticularia lycoperdon* | 53, 54 | 1, 2, 4, 5, 7, 10, 13 |
| *Cribraria argillacea* | 53, 54 | 2, 6, 10, 14 |
| *auriantiaca* | 54 | 2 |
| *cancellata* | 54 | 2 |
| *macrocarpa* | 54 | 10 |
| *rufa* | 53, 54 | 10, 13 |
| *vulgaris* | 54 | |
| **Trichiales** | | |
| *Diamema depressum* | 54 | 10 |
| *Prototrichia metallica* | 54 | 10 |
| *Perichaena corticalis* | 53, 54 | 2, 3, 5 — 8, 10, 11, 13 |
| *depressa* | 54 | 2, 6, 7, 10 |
| *vermicularis* | 54 | 2 |
| *Arcyria carnea* | 53, 54 | 3, 10, 15 |
| *cinerea* | 54 | 2, 6, 10 |
| *denudata* | 53, 54 | 1, 2, 4, 7, 8, 10, 11, 13, 17 |
| *ferruginea* | 54 | 2, 10, 12 |
| *fulgens* | 54 | 5 |
| *incarnata* | 53, 54 | 1, 2, 3, 5, 7, 10, 13 |
| *nutans* | 53, 54 | 1, 2, 4, 5, 7, 10, 13, 14 |
| *pomiformis* | 54 | 2 |
| *Metatrichia vesparium* | 53, 54 | 2, 5, 7, 10, 13 |
| *Hemitrichia clavata* | 54 | 2 |
| *Trichia botrytis* | 53, 54 | 2, 4 — 7, 10, 12, 13 |
| *decipiens* | 53, 54 | 2, 7, 10, 13 |
| *affinis* | 53, 54 | 2, 3, 4, 7, 10, 13 |
| *persimilis* | 53, 54 | 2, 7, 10, 13 |
| *floriformis* | 53, 54 | 1, 4, 7, 10, 13 |
| *varia* | 53, 54 | 2, 3, 4, 6, 7, 10, 13, 14, 15 |
| *lutescens* | 54 | 10 |
| *scabra* | 53, 54 | 2, 4, 6, 7, 10, 13 |
| *verrucosa* | (C. F. Lees) | |
| **Stemonitales** | | |
| *Amaurochaete fuliginosa* | 54 | 2, 4, 5 (and C. F. Lees) |
| *tubulina* | 54 | 4 |
| *Brefeldia maxima* | 54 | 2, 8 |
| *Stemonitis axifera* | 54 | 2, 3, 5, 10 |
| *flavogenita* | 54 | |
| *fusca* | 53, 54 | 1, 2, 3, 4, 5, 8, 10, 13 |
| *herbatica* | 54 | 2, 4, 7 |
| *Comatricha laxa* | 53 | |
| *nigra* | 53, 54 | 1, 2, 6, 7, 10, 13, 15 |
| *pulchella* | 53, 54 | 10, 15 |
| *typhoides* | 53, 54 | 1, 2, 7, 10, 13 |

| | | | |
|---|---|---|---|
| *Enerthenema papillatum* | | 54 | 2 |
| *Lamproderma arcyrioides* | | 54 | 10 |
| *colombinum* | | 54 | 2 |
| *Diachea leucopodis* | | 54 | 2 |
| **Physarales** | | | |
| *Fuligo septica* | (C. F. Lees) | 53, 54 | 2, 3, 5, 7, 8, 10, 11, 15, 18 |
| *cinerea* | | 53 | 14 |
| *Badhamia foliicola* | | 54 | 6, 10, 11 |
| *macrocarpa* | | 54 | 1, 6 |
| *panicea* | | 54 | 2 |
| *utricularis* | | 54 | 2, 6, 8, 10 |
| *Physarum bitectum* | | 54 | 2 |
| *bivalve* | (C. F. Lees) | 54 | 2, 6, 10 |
| *cinereum* | | 54 | 2, 6, 10 |
| *compressum* | | 54 | 2 |
| *didermoides* | | 54 | 3 |
| *gyrosum* | | 54 | |
| *leucophaeum* | | 53, 54 | 13 |
| *nutans* | | 53, 54 | 1, 2, 5 — 8, 10, 13, 14, 15 |
| *nutans v. robustum* | | 54 | 5, 10 |
| *psittacinum* | | 54 | 10 |
| *straminipes* | | 54 | 7 |
| *vernum* | | 54 | 10 |
| *virescens* | | 54 | 10 |
| *viride* | | 54 | 1, 2, 4, 5, 8, 10 |
| *viride v. incanum* | | 54 | 10 |
| *viride v. aurantium* | | 54 | 2 |
| *Craterium leucocephalum* | | 54 | 2 |
| *minutum* | | 54 | 2, 10, 11 |
| *Leocarpus fragilis* | | 54 | 2, 4, 5, 6, 10 |
| *Diderma globosum* | | 54 | 11 |
| *hemisphericum* | | 54 | 2, 10 |
| *spumarioides* | | 54 | |
| *Mucilago spongiosa* | (C. F. Lees) | 53, 54 | 2, 5, 8, 10, 13, 16 |
| *Didymium clavus* | | 54 | 10 |
| *comatum* | | 54 | 3 |
| *difforme* | | 54 | 2, 10 |
| *iridis* | | 54 | 2 |
| *melanospermum* | | 54 | 2, 10 |
| *nigripes* | | 54 | 2 |
| *serpula* | | 54 | |
| *squamulosum* | | 54 | 2, 7, 10 |

## PERIGLACIAL GULLS IN THE UPPER WITHAM VALLEY

P. J. Muskett, m.a.

### Introduction

The Upper Witham flows from its source near South Witham (G.R. 9219: O.S. 1″ sheet 122) northwards across the Kesteven Plateau, incising into the plateau as far as Grantham (9135). The geological sequence revealed on the plateau surface and valley sides is the Inferior Oolite Series: Lincolnshire Limestone underlain by the Lower Estuarine, then the Northampton Sandstone and towards Grantham and in the valley floor the Upper Lias Clay is exposed with alluvium and terrace material covering it in places. The plateau has a partial covering of Chalky Boulder clay, in patches to the west of the Upper Witham, but more continuous to the east. It is clear that the river is post Penultimate Glaciation since it flows as far as North Witham (9221) on the till and at right angles to several buried valleys. Northwards the till is missing from the valley but at Great Ponton (9230) another buried channel has been located by the search for ironstone and mapped by Rice[1]. This channel is also at right angles to the present Witham.

Further east the Kesteven Plateau is dissected and drained southwards by the rivers Glen and Eden. These rivers also lie across the direction of the buried valleys but drain in the opposite direction to the Witham. All three are anomolous to the general eastward slope of the platcau towards the Fens. Kent[2] has suggested a pro-glacial origin for their courses.

The area has obviously had considerable changes of drainage in the Pleistocene period and in the last 400,000 years must have been subjected successively to the onset of the Penultimate Glaciation, to the spread of the ice sheet and the Chalky Boulder clay, to the decay of that ice and the tundra conditions immediately afterwards, to the sub-aerial activity of the Last Inter-glacial, to the periglacial conditions of the Last Glaciation during which the ice reached only to the Lincolnshire Wolds and finally to the Post Glacial climatic changes. It is with the periglacial activity that this paper is particularly concerned.

A study of the vertical aerial photographs* of the Upper Witham valley has revealed a much wider extent of the periglacial activity than was known previously from field evidence and recognised for many years at several isolated sites. Though the ironstone quarrying has brought many features to light the open cast methods have limited this investigation in the south, as indicated on Figure 1. The debouchment of the Witham from the limestone escarpment has been taken as the limit in the north.

**Previous Research**

Jukes-Browne[3] described in 1885 certain features of the Lincolnshire Limestone revealed by the cutting of the railway from Peterborough to Grantham.

> "In the cutting north of Little Ponton there were hollows of considerable size, sometimes 100 yards in length and 50 feet deep . . . (They) apparently follow the direction of the great jointings or fissures of the rocks. They are occupied by more or less stratified masses of clays and sands with pebbles . . . more especially towards the upper portions are thick layers of fragmentary oolite."

He refers also to "hollows filled with similar debris seen in the Great Ponton cutting". He clearly associated these features with some similar ones at Ancaster. Although outside the area of the Upper Witham they can also be seen in a railway cutting (9944) and were described as "Six large trough-like swallow holes . . . filled with clay, sand, loam and limestone rubble and descend below the level of the rails even in the centre (40 feet deep). The width of the third hollow from the east is 40 feet at the top and 30 feet at the level of the rails."

Preston[4] in 1905 described how, during the laying of a water main across a gravel area known as Hog Back Hill, boulder clay "was found filling certain large fissure cracks . . . which extended below a trench line 22 feet deep and had a top width of upwards of 40 yards." His idea of the formation was that the underlying rock had been washed out causing settlement of the limestone which then fractured in lines parallel to the river.

Such features described by Jukes-Browne and Preston have been identified at other sites in the East Midlands and more recently have been classed in the terminology of quarrymen as 'wants' and 'gulls'. Their formation has been accounted for in more detail than was suggested by Preston, though in a similar way. Hollingsworth[5] and Kellaway and Taylor[6] suggest that these features occur particularly in the Lincolnshire Limestone because of the relationship of several factors: the limestone is only 70 to 120 feet thick; it is underlain by the Estuarine clays in places and the Northampton sandstone, with the Upper Lias clay beneath; the limestone is stronger than the rocks underneath and is well jointed whereas the clays are not; the whole has been

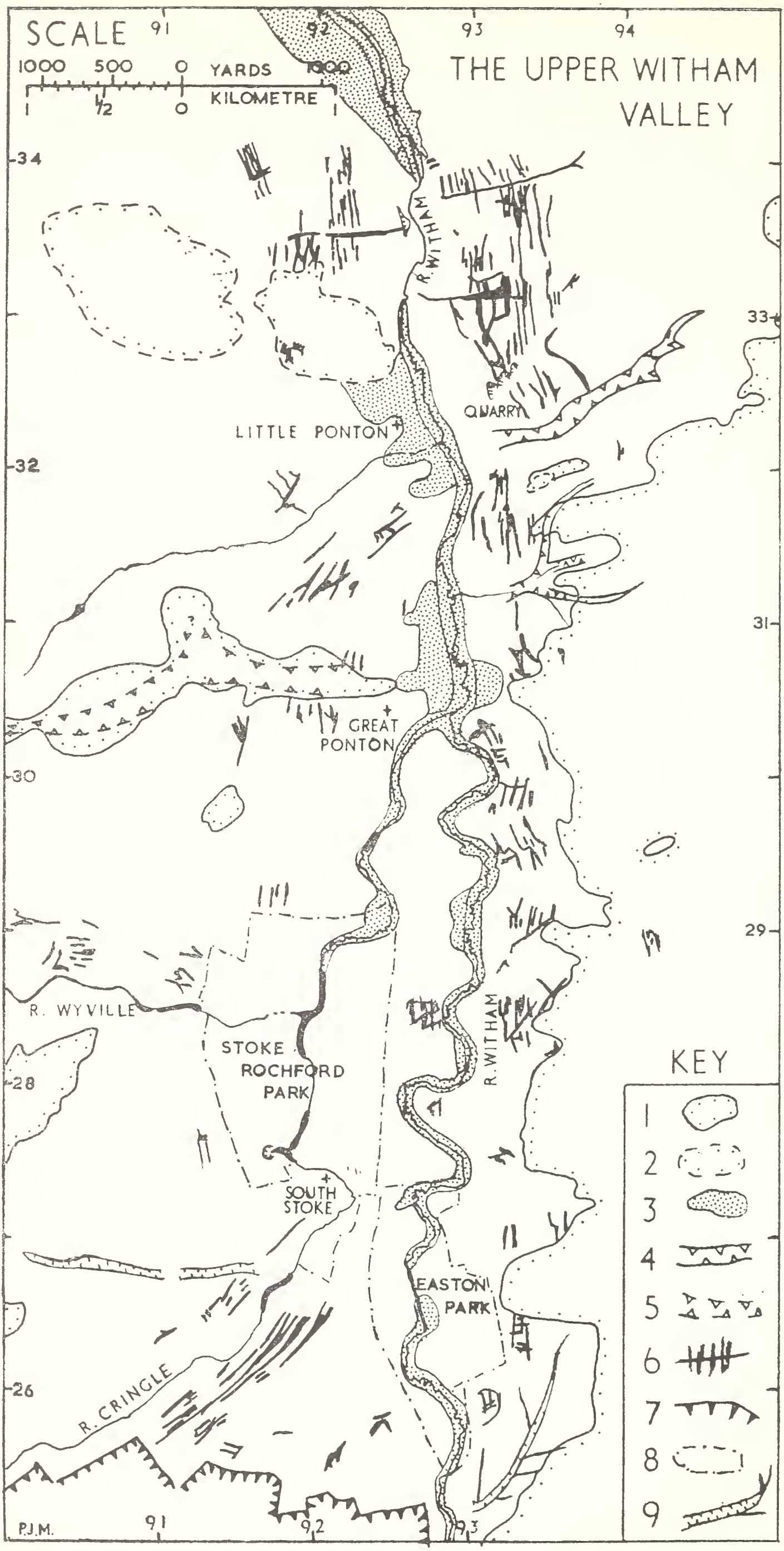

SCALE
1000 500 0 YARDS 1000
1 ½ 0 KILOMETRE 1
THE UPPER WITHAM VALLEY
91
92
93
94
34
33
32
31
30
29
28
26
R. WITHAM
QUARRY
LITTLE PONTON
GREAT PONTON
R. WYVILLE
STOKE ROCHFORD PARK
SOUTH STOKE
EASTON PARK
R. CRINGLE
R. WITHAM
KEY
1
2
3
4
5
6
7
8
9
P.J.M.
91
92
93

*Fig.* 1

subjected to a very deep frost action during the Pleistocene period and the Lias clays have been bulged up to the valley floors and eroded.

During periglacial conditions the clays react differently from the limestone and under pressure from the superficial rocks distort and flow towards the valley where erosion takes place. This squeezing and erosion thins the clays causing the superstructure of limestone to stretch and camber, as shown in Figure 2. The jointed limestone moves laterally splitting into massive blocks which slide sideways towards the valley. The gulls *i.e.* the cracks between the blocks, get choked with frost shattered rubble and eventually filled by solifluction material being washed from slopes higher up on the plateau level. This accounts for the residual clays and angular oolite described by Jukes-Browne. The sandy infilling may well be derived from boulder clays which contain considerable amounts of sand, which may be of local origin for the Northampton Sandstone layer is up to 30 feet thick.

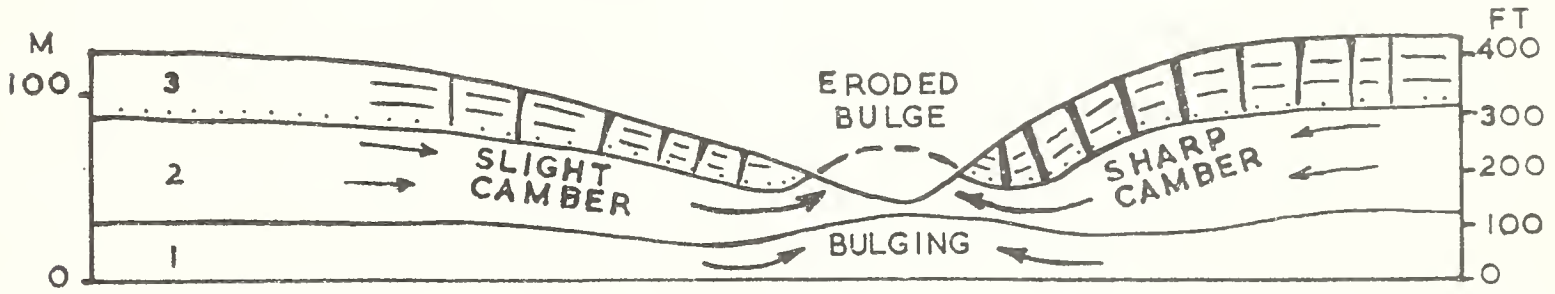



*Fig. 2*

Alteration of the Inferior Oolite under Periglacial Conditions.

*Key:* 1, Middle Lias. 2, Upper Lias Clay. 3, Inferior Oolite Series: Northampton Sands, Lower Estuarine Sands and Clay, Lower Lincolnshire Limestone.

**The Landforms**

The surface of the areas which have been affected by this characteristic periglacial gulling shows slight corrugation. The limestone blocks stand higher and, due to the relatively thin stony soils, appear lighter in colour; the gulls make slight hollows and, containing a greater clay fraction, show a darker tone. The relative porosity is also reflected in the contrast of colour. This slight undulation and distinctive colour tone is very apparent in the Little Ponton area when viewing from the old A1 road approximately opposite to the Saltersford Waterworks (9233). The gulls which Jukes-Browne described can still be seen, though partly covered by grass, in the railway cutting. The further extension of them can be inspected closely in section in the abandoned quarry (932326). The character of this group of gulls is inferred in Figure 3. They show up extremely well on the aerial photograph and their density is equally apparent on Figure 1.

The general convexity of the slopes is modified by the gulls which are parallel to the valley direction. By the manner of their formation the huge blocks of limestone, cambered towards the valley, slide downslope, thus leaving the gulls on the upslope side. The gulls, therefore, usually occur in 'swarms' and are

---

*Key:*

1. Boulder Clay.
2. Glacial Gravel.
3. River Gravel and Alluvium.
4. Steep-sided dry valley, probable overflow channel.
5. Buried steep-sided valley.
6. Gulls crossed by dry valleys.
7. Limit of ironstone quarrying.
8. Extent of Parklands.
9. Other dry valley systems.

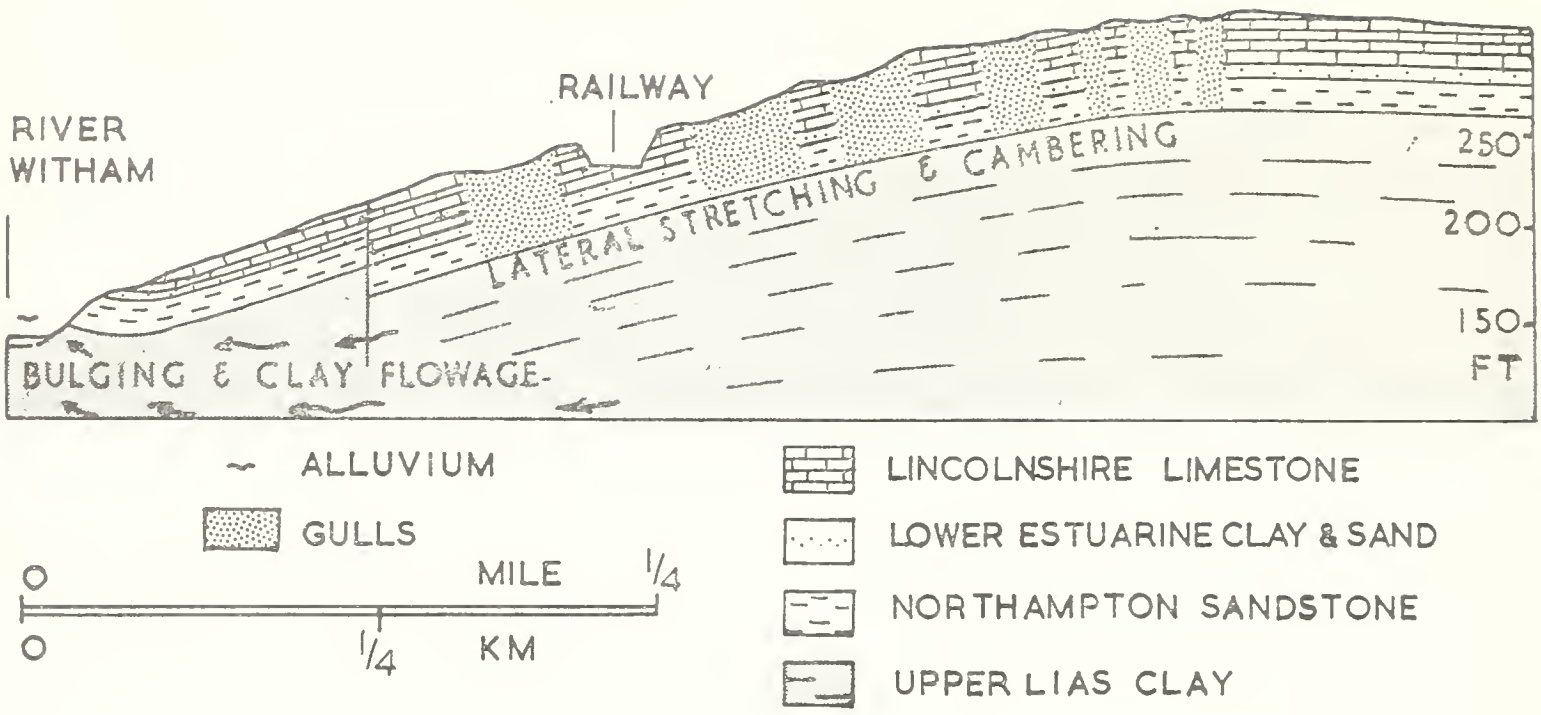



*Fig. 3*

Gulls north-east of Little Ponton. The line of section is taken along Northing 33 from 926330 to 936330

easily distinguished from dry valleys which cross the main valley side to join the Witham. The higher water table in the dry valleys makes them show on the aerial photographs as darker areas in precisely the same way as the gulls, but their sinuous form, their integration into a system and their direction down the valley side across the gulls easily identifies them and shows them to post-date the gulls. Only the larger of the dry valleys have been indicated by a different symbol on Figure 1.

**Gaps in the Distribution**

It is apparent from the map that there are several factors controlling the visibility of the periglacial gulls.

1. The Drift Materials

(a) *The Gravels* to the west of the Upper Witham and to the north of Little Ponton cover many acres of the valley side and plateau top. No gulls can be seen in the field, though the aerial view indicates some in the south west corner. However, the report from the Water Board engineer, Mr. Preston, proves they do exist beneath the gravel. The attitude of this patch of gravel and its fabric content indicate that it belongs to the retreat stage of the Penultimate ice sheet thus probably dating the buried gulls as earlier to the onset of that ice sheet. The implication then follows that this portion of the Upper Witham valley existed prior to the onset of the Penultimate Glaciation since the bulging of the clays under deep frost action must have been towards the valley where erosion would have taken place. The buried channel at Great Ponton may, in these circumstances, have been the headwaters or a tributary of that earlier stream and the present Witham is occupying an earlier valley which has been re-excavated.

(b) *The Boulder Clay* distributed to the east of the main valley blankets any evidence of gulls, yet the lie of several which abut the till edge suggests they may continue beneath it. Here again the dating of their formation may be as early as the advance of the Penultimate Glaciation. There could also be a connection between gulls and the sink holes on the Lincolnshire Limestone considered by Hindley[7]. With the concentration of run-off from the boulder clays it may not be by chance that the water finds its way into the limestone;

gulls of periglacial origin could easily offer a ready-made downward course. Ford[8] quotes some evidence to support this view, and further investigation of the Glen valley may reveal such coincidence.

(c) *The Alluvial material* obscures much of the valley floor and there would seem to be a similar gap in the distribution. But no gulls approach these deposits and their occurrence in such a position would be remarkable for gulls appear only in the limestone, and the rocks outcropping on the lower valley sides adjacent to the floor are those Jurassics beneath the limestone: the Lower Estuarine, the Northampton Sands, and the Upper Lias Clays. No gulls can thus be obscured by the terrace materials and the alluvium.

2. The Parklands

Stoke Rochford (9127) and Easton (9226) parishes both retain considerable areas of parkland which afford no photographic evidence of gulls or dry valleys. The latter are easily traceable on the ground but do not show on the vertical aerial photographs, no doubt because of the long established parkland vegetation. No gulls have been detected on the ground though several small fissures up to a foot in width were revealed in the limestone beneath the vegetation and soil cover at 922276 when a sewer trench was cut during the summer of 1968. These small wants indicated lateral movement of the oolite towards the Cringle valley.

**The Distribution of the Gulls**

The map drawn from field evidence and the aerial photographs indicates a close relationship of the gulls to the valleys. They are restricted to a narrow zone on either side and their profusion increases northwards as the depth of the valley increases. In the south the river is at 280 feet O.D. and the plateau level at 390 feet O.D.; in the north the river is at 175 feet and the plateau is at 400 feet.

Although the drift obscures much of the eastern flank, the width of the zone of gulls clearly increases northwards, *i.e.* downstream, and the greatest profusion or swarm is on the west-facing eastern slope of the Witham valley.

There are only three tiny right bank tributaries in this part of the Upper Witham, the majority of the additional flow comes from the Cringle and the Wyville on the left bank. The Cringle cuts down in a very sharply incised valley to the Upper Lias Clays near South Stoke and a marked swarm of gulls occurs at 9125 and 9126. This is also a north-west facing slope. Aspect may be significant even under widespread permafrost conditions.

One complicating factor, however, in the interpretation of the occurrence of the gulls is that the valleys in this area are asymmetrical in their south-north sections. It is on the more steeply undercut slopes that the greater profusion is evident. Two factors are significant: the depth of incision and the degree of cambering. The depth of incision affects the amount to which cambering can take place, so that there are more gulls in the downstream direction where the valley deepens from 110 feet to 225 feet. The degree of cambering must be affected by the asymmetry: on the gentler slope there is a greater distance over which the detached limestone blocks could slide but on the undercut slope the cambering would be sharper causing greater fracturing of the oolite layer, opening up wider gulls. Near Little Ponton the right flank gulls are not only more numerous but individually wider than those on the opposite flank.

**Conclusion**

The presence of so many gulls indicates that the periglacial processes were very active over an extensive area of the Upper Witham valley. It is clear too, that the vertical aerial photographs are valuable in highlighting slight variations not all apparent in the field.

The dating[9] of the gulls is not conclusive: while periglacial activity must have been dominant in this area during the Last Glacial the presence of gulls under drift deposits suggest that the onset conditions of the Penultimate ice sheet may also have been important. If so, then parts of this Upper Witham valley must have been in existence then. Alternatively, the cambering took place under boulder clay and gravel of the earlier glaciation, thus causing that cover to slump into the gulls. In such a situation the valley must date from the last interglacial period.

One complicating factor in suggesting a date for the gulls as pre-Penultimate ice is the erosive power of the ice. If the limestone blocks were already detached and sliding over the underlying clays, would the ice remove them in a southerly direction *en masse*? There are several such rafts of erratic limestone and marlstone as far as ten miles from the nearest outcrop. There is every likelihood that the ice modified the Witham valley, grooving it more deeply than the present landforms suggest; the sand, gravel and peat in Grantham has been proved more than thirty feet deeper than the river level.

The weight of evidence favours the Last Glacial as the most likely time for the gulls to be created, widened and infilled.

*Kesteven County Council Planning Department, 1966 (flown by Hunting Aerosurveys Ltd.).

**References**

(1) RICE, R. J. "The Early Pleistocene Evolution of North Eastern Leicestershire." *Inst. Brit. Geogr. Trans.* 37 (1965) 101 — 110.

(2) KENT, P. E. "Notes on River Systems and Glacial Retreat Stages." *Proc. Geol. Assoc.* 50 (1938) 164 — 167.

(3) JUKES-BROWNE, A. J. "The Geology of the South West Part of Lincolnshire." Sheet 70 (old series). *Mem. Geol. Survey* (1885) Ch. X.

(4) PRESTON, H. "Excursion to Mid-Lincolnshire, Easter 1905." Report. *Proc. Geol. Assoc.* (1905) 114 — 123.

(5) HOLLINGSWORTH, S. E., TAYLOR, J. H. and KELLAWAY, G. A. "Large Scale Superficial Structures in the Northampton Ironstone Field. *Quart. Journ. Geol. Soc.* 100 (1944) 1 — 44.

(6) KELLAWAY, G. A. and TAYLOR, J. H. "Early Stages in the Physiographic Evolution of a Portion of the East Midlands." *Quart. Journ. Geol. Soc.* 108 (1952) 343 — 376.

(7) HINDLEY, R. "Sink Holes in the Lincolnshire Limestone between Grantham and Stamford." *East Mid. Geogr.* 24 (1965) 454 — 460.

(8) FORD, T. D. "A further Note on Sinkholes in Lincolnshire." *East Mid. Geogr.* 26 (1966) 113 — 114.

(9) STRAW, A. "Pleistocene Events in Lincolnshire — a Survey and revised Nomenclature." *Trans. Lincs. Nats. Union* 17 (1969) No. 2 Part I 85 — 98.

## THE CONTRIBUTION OF WALTER J. WOOD [1862-1939] TO LINCOLNSHIRE MICROSCOPICAL WORK

M. R. D. SEAWARD, M.SC.

Walter James Wood was the son of Dr. J. Wood (1825-1892), one time minister of the Flottergate Primitive Methodist Chapel, Grimsby, and Principal of Manchester College; several references to Dr. Wood are to be found in Shaw (1893). W. J. Wood's youth was spent largely at sea, starting as a junior engineer and ending up as a chief engineer. He travelled widely, but about 1905 he settled in Grimsby; Sir George Doughty, M.P., was instrumental in his appointment as marine surveyor to the National Steam Fishing Company (see Lincoln 1915). Later he became a consulting engineer, working on his own, and continued as that for the rest of his life until he became too infirm — the result of a stroke about four years before his death. He was buried at Scartho cemetery, Grimsby, with his wife (who pre-deceased him in 1924) and one of his sons.

During the First World War W. J. Wood was consultant marine surveyor to the Ministry of Agriculture and Fisheries in Grimsby. His work during this period was mainly concerned with the conversion of trawlers for fishery research. This was by no means his first introduction to this type of work; indeed he had taken part in the reconstruction of a trawler (later renamed *Huxley*) which was purchased in 1902 by the Marine Biological Association of the United Kingdom for work (under a government grant) in connection with Le Conseil Internationale pour l'Exploration de la Mer. W. J. Wood superintended the reconstruction of five other ships used for marine survey work; he was also consulted in connection with the equipping of the celebrated *Discovery* for the Falkland Island Survey.

Besides being a Member of the Institution of Mechanical Engineers and a Justice of the Peace, he was intensely interested in the Boy Scout Movement and became Commissioner of the Movement for the Grimsby District.

W. J. Wood had two sons and a daughter. Both sons died during the First World War: Edwin L. Wood (1892-1917) joined the 1st Royal Scots Fusiliers and was killed in France; Walter B. Wood (1897-1917) served in the Hampshire Regiment and Royal Flying Corps, and was accidentally killed in a practice flight in England. Biographies of Edwin, soldier and naturalist, and Walter, airman and scout, have been compiled and chronicled from their letters and papers by Bygott (1919); a father's tribute appears at the end of this work.

The naturalistic work of W. J. Wood is not widely known. The results of his extensive labours were never published. He can best be described as one of the backroom boys, since his interests were centred mainly around his microscope work and he devoted much of his time to the identification and preservation of material collected by others (e.g. *The Naturalist*, 1902, 209-210; 1903, 122; 1905, 316-317). He was one of the founder members of the once-flourishing Grimsby and District Antiquarian and Naturalists' Society (founded 1896; disbanded 1952), being elected Council Member in 1901, and President of its Microscopy Section in 1906. He provided demonstrations and lectures on microscopical life, and in the use of the microscope and microtome. He was elected a Fellow of the Royal Microscopical Society in 1899.

By the generosity of his daughter, the late Mrs. D. A. H. Knott, W. J. Wood's valuable microscopical collection is now in my care. During the past four years I have had the opportunity to sort through the material, and a clearer picture of his contribution to natural history (as collector, preservator and determinator), especially in North Lincolnshire, emerges. The thoroughness of his mounting techniques (undertaken mainly between 1892 and 1914) has made it possible to determine/confirm many of the specimens with accuracy. A wide range of air, liquid and canada balsam mounts have been employed. Whole mounts and sections (some serial), using a variety of staining techniques, are represented. All mountings are well labelled, and in many instances details of the stains and mountants used are given. In some cases details of the collection (date, locality and sometimes habitat) are given; these have proved most valuable in local fauna and flora distribution studies.

**Check-list of Microscope Slides**

1.1 Protozoa (26) — mainly preparations of Foraminifera from both British coastal waters and deep-sea soundings.
1.2 Porifera (5)
1.3 Coelenterata (16)
1.4 Platyhelminthes (1)
1.5 Nematoda (2)
1.6 Annelida (2)

1.71 Crustacea (24)
1.72 Insecta (261) — there is a more comprehensive coverage of this class to give some indication of the wealth of records to be gleaned from examination of the slides. Lincolnshire records only have been itemized; new county records of Diptera are indicated by an asterisk (*cf.* White, 1946)

*Sminthurus viridis* (L.) Grimsby, 1895
*Isotoma arborea* (L.) Grimsby, 1910
*Lachesilla pedicularia* (L.) Grimsby, 1895 — see: *Trans. Lincs. Nat. Union*, **17**, 157.
*Nepa cinerea* L. Clee, 1895
*Velia caprai* Tam. Grimsby, 1894
*Hydrometra stagnorum* (L.) Irby, 1908; Grimsby, 1907
*Baetis rhodani* (Pictet) Bradley, 1908
*Cloeon dipterum* (L.) Little Coates, 1896
*Xantholinus glabratus* (Grav.) Grimsby, 1907
*Haliplus ruficollis* Degeer Clee, 1894
*Melolontha melolontha* (L.) Grimsby, 1897
*Gyrinus natator* L. Grimsby, 1897
*Panorpa germanica* L. Grimsby, 1909
*P. communis* L. Irby, 1910
*Acherontia atropos* L. Grimsby, 1900
*Lasiocampa quercus* (L.) Grimsby, 1914
*Arctia caja* (L.) Grimsby, 1894
*Collyria calcitrator* (Grav.) Irby, 1916
*Cephus pygmaeus* (L.) Grimsby, 1903
*Ceratophyllus f. farreni* Roths. Grimsby, 1911
*C. h. hirundinis* (Curtis) Grimsby, 1911
*Hystrichopsylla t. talpae* (Curtis) Grimsby, 1899
*Ctenocephalides canis* (Curtis) Grimsby, 1912
*Palaeopsylla m. minor* (Dale) Grimsby, 1909
*Monopsyllus s. sciurorum* (Schrank) Grimsby, 1912
*Tipula oleracea* L. Grimsby, 1896
*Nephrotoma flavescens* L. Grimsby, 1909
*Limonia flavipes* Fab. Grimsby, 1910
*Trichocera hiemalis* Deg. Grimsby, 1908
*Sylvicola fenestralis* Scopoli Grimsby, 1893 and 1910
*S. punctatus* Fab. Roxton Wood, 1908
**Ptychoptera minuta* Tonnoir Grimsby, 1910
*P. albimana* Fab. Irby, 1909
*Anopheles maculipennis* Mg. Grimsby, 1908
*Culex pipiens* L. Waltham, 1900; Grimsby, 1894
*Hydrobaenus stercorarius* Deg. Grimsby, 1909
*Simulium reptans* L. Freshney, 1909
*Bibio marci* L. Grimsby, 1895
*Dilophus febrilis* L. New Holland, 1908; Grimsby, 1909
*Beris vallata* Fost. Freshney, 1909
*Microchrysa polita* L. Grimsby, 1908 and 1909
*Rhagio tringaria* L. Great Coates, 1909
*Chrysops caecutiens* L. Hatcliffe, 1908
*Haematopota pluvialis* L. Grimsby, 1909
*Empis livida* L. Grimsby, 1909
**Sciopus wiedemanni* Fln. Grimsby, 1912
*Lonchoptera lutea* Pz. Grimsby, 1909
*Eristalis tenax* L. Grimsby, 1892 and 1904
*Rhingia rostrata* L. Irby, 1910
*Neoascia podagrica* Fab. Grimsby, 1911
**Syrphus corollae* Fab. Grimsby, 1892
**S. quadrimaculatus* Verrall Grimsby, 1909
**S. auricollis* Meig. Grimsby, 1908
*Platystoma seminationis* L. Grimsby, 1908
*Herina fondescentiae* L. Grimsby, 1909
**Palloptera quinquemaculata* Mcq. Grimsby, 1909
*Toxoneura muliebris* Harris Grimsby, 1909
*Tephritis bardanae* Schrk. Grimsby, 1910
**Lyciella rorida* Fall. Grimsby, 1896
**Calobata petronella* L. Grimsby, 1901
*Tephrochlamys rufiventris* Mg. Grimsby, 1909
*Opomyza germinationis* L. Grimsby, 1910
*Copromyza equina* Fln. Grimsby, 1909
**C. nitida* Mg. Cleethorpes, 1909
*Scatophaga stercoraria* L. nr. Grimsby, 1895
*S. litorea* Fln. Cleethorpes, 1909
*Sarcophaga carnaria* L. Irby, 1911
*Calliphora vicina* Desv. Grimsby, 1908
*Lucilia caesar* L. Grimsby, 1893
*Protocalliphora sordida* Zett. Grimsby, 1910
*Dasyphora cyanella* Mg. Irby, 1910
*Stomoxys calcitrans* L. Grimsby, 1910
*Ophyra leucostoma* Wied. Grimsby, 1909
*Hydrotaea dentipes* Fab. Grimsby, 1908
**Coenosia intermedia* Fln. Waithe, 1909
**Pseudonupedia intersecta* Mg. Irby, 1909
*Melophagus ovinus* L. Grimsby, 1911

1.73 Myriapoda (1)
1.74 Arachnida (12)
1.8 Mollusca (10)
1.9 Echinodermata (5)
2.1 Chaetognatha (2)
2.2 Chordata (70) — mainly anatomical
3.1 Thallophyta (16)
3.2 Bryophyta (3)
3.3 Pteridophyta (6)
3.4 Spermatophyta (93) — mainly anatomical
4.1 Petrology, Crystals and Textile Fibres (56)

I would like to express my thanks to Mr. D. A. H. Knott for his help in the preparation of the biographical notes, and to the members of the Department of Entomology of the British Museum, especially Mr. K. G. V. Smith, for their determination/confirmation of the dipteran preparations.

**Bibliography**

BYGOTT, J. (1919). *Two Soldier Brothers*. London.

LINCOLN, B. (1915). *Life of Sir George Doughty, M.P.* London.

SHAW, G. (1893). *Life of Parkinson Milson*. London.

WHITE, J. H. (1946). A Preliminary list of the Lincolnshire Diptera. *Trans. Lincs. Nat. Union*, **11,** 163 — 175. (Corrections — 1947: **12,** 59; additions — 1950: **12,** 210 — 211).

# BENINGTON MARSH 1970

P. J. Wilson

In view of schemes proposed for using the Wash as the site of fresh water storage reservoirs, it was decided that the 395th field meeting held on 10th August, 1970 would take the form of a one day investigation into the ecology of the Benington saltmarsh (also known as Butterwick marsh).

The flora of the gradually sloping shore was examined along a transect line starting at the top of the outer sea bank at a point approximating to the Frieston-Butterwick parish boundary (TF. 407439) and finishing 4200 ft. east at a point approximately TF. 419434. Using a 100 ft. tape and marking canes, the occurrence and dominance of plant and animal species were noted. These are plotted on the accompanying diagram. At various points along the transect line a typical square yard was found and plotted.

The most important single factor deciding the range and dominance of plants and animals is the (degree of) drainage of the saltmarsh. The second important factor, at least on the upper, better drained areas, is the selective grazing of the sheep and cattle (20 sheep and 107 cattle were grazing the upper marsh). Also the true rough pasture to saltmarsh plant succession has been truncated, and on site it was obvious that the two sea banks were responsible for this.

Such plants as *Limonium vulgare* (Sea Lavender), *Artemisia maritima* (Sea Wormwood), and *Festuca rubra* (Red Fescue) were probably not recorded in their true zones. The area where these species would be dominant is now arable land between the sea banks and perhaps even further inland.

Plant species characteristic of the lower saltmarsh may be found high on the marsh on the inner slopes and muddy bottoms of the channels. This was especially noted of *Aster tripolium* (Sea Aster) and *Salicornia europaea* (Glasswort). Similarly plants characteristic of the higher landward edge of the saltmarsh were to be found much lower on the well-drained edges of channels and other slight rises. *Artemisia maritima* was especially noted as occurring on the well drained edges of channels. The range of the grass, *Puccinellia maritima* (Common Saltmarsh Grass) was extended by approximately 300 ft. by the single addition of a dominant area on a small rise at 2100 ft. Both *Aster tripolium* and *Salicornia europaea* extended some further 400 ft. seawards along the edges of a large channel that ran diagonally across the transect at 3800 ft.

Only one plant of *Juncus gerardii* (Saltmarsh Rush) was found at 62 ft. in association with *Limonium vulgare* and *Spergularia marina* (Sea Spurrey). The last vegetation was a clump of *Spartina anglica* (Rice Grass or Cord Grass) at 4193 ft., but between 4000 and 4100 ft. there had only been two clumps of *Spartina*, the largest of which was of approximately one square foot.

A filamentous algae was present between plant stems from 2000 ft. to the last clump of *Spartina*. The seaweed *Ulva lactacae* (Sea lettuce) was first noted at 3800 ft. and occasionally thereafter.

No soil samples were taken but the surface mud was at first dry and cracked; in this way it was possible to see that some of the pools were of only a temporary nature. Further down the saltmarsh the mud was shining and wet, but at 3500 ft. it was noted that the substrate was now more sandy than muddy. At 3800 ft. the surface was typically wave rippled.

PLANTS

Distribution

Enteromorpha intestinalis
Aster tripolium
Festuca rubra
Artemisia maritima
Spartina townsendii
Plantago maritima
Salicornia marginata
Halimione portucaloides
Limonium vulgare
Sueda maritima
Spergularia marina
Cochlearia anglica
Agropyron pungens
Agropyron junceiforme
Developed grass ley with weeds

feet
500 1000 1500 2000 2500 3000 3500 4000

Range of dominance

Lolium perenne
Agropyron junceiforme
Agropyron pungens
Puccinellia maritima
Artemisia maritima
Limonium vulgare
Festuca rubra
Halimione portucaloides
Sueda maritima
Aster tripolium
Spartina townsendii
Salicornia spp.

Vertebrates
Invertebrates

Sheep
Cattle
Littorina saxatilis
Corophium volutator
Cardium edule
Arenicola marina
Nereis diversicolor

Physical features

Mud flat trodden by cattle, water slight pans & algae & bare mud

Channel 1ft wide, 2 ft deep
deep depression

Channel 1ft wide
slight depression

Channel 4ft wide 4ft deep
slight depression
Channel 6 in wide, 1ft deep
" 1ft " 5ft "
Two shallow temporary pools c. 2.5 ft
Channel 4ft wide 4ft deep
large shallow depression

Channel 18 ins wide

Channel 2ft wide
with table 1" below surface
two small permanent pools

Permanent pool 12 ins diam
bare patches mud

Channel 19ft wide

Channel 2ft wide

water table about at surface
mud channels

depression with 2 ins water

many shallow channels
and about three small
permanent pools per 100 ft

water covers c. 1/3 of surface
at 1-2 ins. depth

Slight mist; water
covers 5-10% of surface

water covers 30% surface

20% surface bare mud

Channel 20ft wide
substrate more sandy
undulating surface

largely bare of vegetation

This report differs markedly from an earlier report on the ecology of the Wash saltmarshes (Newman and Walworth 1919) in that *Puccinellia maritima* is now the dominant saltmarsh grass at Benington and not *Festuea rubra* as was found in 1919, and further, that they record the presence of *Zostera* spp. and make no note of *Spartina townsendii*. The hybrid *Spartina* had apparently not reached the North Wash saltmarsh in 1919. It is noteable that the spread of *Spartina townsendii* should also be paralleled by the decline and elimination of *Zostera*. At the time of Newman and Walworth's report there was only one sea bank, a second being constructed soon afterwards reclaiming some 500 yds. of saltmarsh. This may be responsible for the absence of their *Festuca rubra* zone, though grazing pressure cannot be ruled out as *Festuca* seems a much more palatable grass than *Puccinellia maritima*.

**Crustacea.** The Shore Crab *Carcinus maenus* was present at 160 ft. in a small channel only 2 ft. deep and was then recorded in all similar locations to the end of the transect. The distribution of *Corophium volutator* is illustrated on the diagram.

Three molluscs locally present were *Hydrobia jenkinsi*. which was first found in a shallow pond at 541 ft. and thereafter in three similar situations at 1450 ft., 2300 ft. and finally at 3500 ft.; *Mytilus edulis* (Common) Edible mussel was only met once at 3500 ft. in a large channel; and *Mya truncata*, a clam or gaper, was first noted at 436 ft. in a channel and again at 2150 ft. and finally at 3500 ft.

**Fish.** *Gobius minutus* were present in channels and standing permanent pools between 2150 and 3600 ft.

**Insects.** Only three insects were noted as being especially associated with the saltmarsh. Two of these, a pond skater *Gerris* sp. and Mosquito larvae, *Anopheles* sp. were only found in channel bottoms between 150 and 400 ft. However an aphid particularly associated with Sea Aster was noted as infesting the flower heads at 3100 ft.

**Birds.** Redshank was noted at 250 ft. feeding in a small channel and was thereafter met occassionally to the end of the transect, but was always flushed out of channels. A similar association with the channels was noted with Black-headed Gull which seemed to obtain most of its food from them. Curlew, Whimbrel and Greenshank were noted feeding at approximately 2000 ft. Five Oyster-catchers and 574 Dunlin were seen feeding on the open sand and mud just beyond the point where the transect line ended. Only three species of passerines were seen associated with the saltmarsh. Skylark occupied the higher and drier area and did not extend further than 500 ft. Both Reed Bunting and Meadow Pipit were then present though Meadow Pipit extended further down the marsh and was last seen singing (*i.e.*, holding territory) at 1350 ft.

Throughout the investigation and the compiling of this report, I have been very conscious of the fact that it would have been impossible without the full support of Union members and the co-operation of the sectional officers who were present.

**References**

GRAY, A. J. "Townsend's Cord-grass". *Trans. Lincs. Nats. Union*, Vol. XIV, No. 4, December, 1959.

NEWMAN, L. F. and WALWORTH, G. "A preliminary note on the ecology of part of the South Lincolnshire Coast". *J. Ecol.*, 7, pp. 204 — 210.

TEATHER, D. C. B. "Some factors limiting the distribution of *Halimione portulacoides* (L) Aell. var. *latifolia* (Gussone): submergence and soil types". *Trans. Lincs. Nats. Union*, Vol. XVI, No. 2, 1965.

## BOTANY

Miss E. J. Gibbons, f.l.s.

The spring began late, after a cold winter, and it was late in May before much was flowering. June was warm and pleasant and brought everything on quickly. Newball Wood had few flowers in bloom. Anemones and Primroses and a few patches of Wood Sorrel (*Oxalis acetosella*) were seen. Part of the wood has been cleared and replanted but the rest is scrub, grown up after wartime felling. On a later visit one shrub of Alder Buckthorn (*Frangula alnus*), and Great Woodrush (*Luzula sylvatica*) were seen.

Dobbin Wood is unlike other woods in the Bourne district in having a peaty, acid soil. There was much bracken and some bluebells. Lady's Mantle (*Alchemilla vestita*) recorded there in 1836 was refound but Heath Bedstraw (*Galium saxatile*) was a new record.

Osgodby Moor: since the Union's visit in 1951 the conifers have grown into a dense mass but the rides had a variety of moorland acid soil plants. Heather of three sorts, Harebells (*Campanula rotundifolia*), Wood Cudweed (*Gnaphalium sylvaticum*), Golden Rod (*Solidago virgaurea*), Wood Sage (*Teucrium scorodonia*), Hard Fern (*Blechnum spicant*) and Lady Fern (*Athyrium filix foemina*) were seen.

Welton Wood: the Fungus Foray is always rather late for flowers but the woods were very pleasant. Spindle berries (*Euonymus europaeus*) made a good show and the quarry and arable fields had a few interesting flowers left, including the Halberd leaved Fluellen (*Kicksia elatine*) and Marjoram (*Origanum vulgare*).

**County Record**

| | | |
|---|---|---|
| *Callitriche truncata* | Div. 6 | Mrs. B. Howitt |

**Divisional Records**

| | | |
|---|---|---|
| *Oenanthe crocata* | 2 | E.J.G. and Nature Cons. |
| *Hypericum dubium* | 4 | E.J.G. |
| *Hypericum montanum* | 4 | E.J.G. |
| *Veronica polita* | 6 | E.J.G. |
| *Potamogeton polygonifolius* | 10 | J. Blackwood |
| *Galium saxatile* | 16 | L.N.U. |
| *Centaurium pulchellum* | 17 | Mrs. K. Wherry and E.J.G. |
| *Solanum sarrocoides* | 3 and 6 | S. A. Cox and Mrs. B. Howitt |
| *Convallaria majalis* | 15 | J. C. Faulkner |

## THORNE WASTE 1970

Mrs. I. Weston, b.sc.

A most successful field meeting was held on Thorne Waste, uniquely led by Mr. William Bunting. A recent fire had destroyed a good deal of the moorland vegetation but most of the plants expected in the wetter boggy places were flourishing.

This area is of immense ecological significance and is important in containing not only some of the rarer British species, but also others which normally do not occur in the Eastern Counties. The habitat types exhibited within Thorne Waste are worthy of every attempt for its conservation. They represent one of the richest lowland peat vegetation areas in the east of England and the raised bog complex with its old peat cuttings, dissected by peat canals, show a wealth of vegetation seldom seen. The older cuttings are richest, but the others show a transitional series of development. These could provide an unprecedented opportunity for studies on the effect of peat cutting and the development from and deterioration of a raised bog complex. The canals vary in size and depth

and are becoming colonised, showing transitional and variable aquatic communities. Many of the interesting areas are difficult of access and a casual visitor might miss quite a number of the species by only using moorland paths and not venturing into the wet, often dangerous, areas.

Under the guidance of Mr. Bunting the Union botanists had a rewarding day. They concentrated first on the colliery and warping areas, the drains, the peat canals linking up the cuttings and then on the peat cuttings themselves, last worked in the 1870s. The colonised canals and cuttings were the richest areas. The 'gigas' proportions of the *Andromeda polifolia* on the banks was remarked upon and in general the luxuriant growth form of each species. The Andromeda in Thorne Waste is exceptionally fine.

Other notable plant species included *Potentilla palustris*, *Utricularia vulgaris*, *Potamogeton* and *Lemna spp.* in profusion, *Phragmites*, *Calamagrostis canescens*, *C. epigejos* and particularly *C. stricta;* also possibly the hybrid *C. canescens* x stricta. Regenerating *Osmunda regalis* on the banks. *Blechnum spicant*, *Vaccinium oxycoccus* in quantity and very fine, *Scirpus lacustris* and *S. tabernaemontani*, *Drosera rotundifolia* and *D. intermedia*, *Cladium mariscus* in one stand, *Triglochin palustre*, *Eriophorum vaginatum*, *E. augustifolium*, *Salix repens*, and *Eleocharis palustris*.

In many of the bogs the plant succession towards drier moor could be seen. The moorland areas had a fringe of *Rhododendron*, the drier peat areas had *Calluna vulgaris*, *Bracken*, *Birch* and *Willow* with regenerating *Oak*. Much of this was extensively damaged by fire. On the damp edges *Pinquicula vulgaris*, *Erica tetralix* and *E. cinerea* were seen. Also *Ophioglossum vulgatum* and *Lathyrus palustris* were recorded. (*Scheutzeria palustris* and *Viola stagnina* were looked for).

The area was obviously rich in the Sphagnum species, rushes and sedges, but the plant list, though impressive, does not fully indicate by numbers alone the ecological importance of this area in Britain.

The area has been well described by W. Bunting and P. Skidmore in their recent papers.

Bunting, W. *et al* 1969. "An outline study of Hatfield Chase." Thorne.
Skidmore, P. 1970. "Fifty years later — another look at Thorne Waste." *Naturalist* No. 914, 1970 (*Yorks. Nat. Union*).

## MYCOLOGY

H. J. Houghton

1970 has been an exceptionally dry year for the most part, and this has been reflected in the number of specimens and species extant. A highlight of the year came between 14th and 18th May, when the British Mycological Society held their annual spring foray in Lincolnshire, based on Lincoln. Seven wooded areas were visited and, despite the exceptionally dry time, numerous records both for the County and for the Divisions round Lincoln will result. The final lists are not yet to hand, but they will be given in the next issue of *Transactions*.

The first outdoor meeting of the Union was organised by the South Humberside Group in Mausoleum Wood, Limber on 12th April. It was, of course, very early in the year, and spring proved to be very late. Thus, 23 species only were found, mainly lignicolous types, but 13 of these, including the small *Xylosphaera carpophila*, proved to be new records for Division 3.

The meeting at Newball Wood, near Bardney was even dryer, and only seven species were found — all on wood with the exception of the rust *Uromyces ficariae* on the leaves of the lesser celandine. On 12th June Colsterworth and Swayfield quarries were visited under the leadership of Dr. Kent. The emphasis was on geology, but a good stand of *Silene alba* infected with the smut *Ustilago violacea* was found.

Previous to the meeting held in Yorkshire at Thorne Waste, on 4th July, there had been a disastrous fire which had devastated large areas of the moor. Two ascomycetes peculiar to burnt areas were found in quantity, namely *Anthrocobia meleloma* and *Pyronema omphalodes*, but there were few others growing in the dust and charred remains. These species are not, of course, in the Lincolnshire records.

Burwell Wood, visited on 11th July with the South Humberside Group, produced one agaric and two rusts only. Conditions by this time were getting very dry indeed. Some members attended the 'recording' meeting at Benington Marsh on 8th August and, although four species only were found, *all* were new records for the very little worked division.

After the ornithology meeting at Gibraltar Point, a few members visited Welton Woods as a preview to the annual Fungus Foray. Conditions were still very dry, with few specimens in evidence. However, when the foray took place on 24th October conditions were very much better, and a very mixed 'bag' of 89 species was collected by a good gathering of members. Miss G. M. Waterhouse again made her annual pilgrimage from Kew into the wilds of Lincolnshire to lead the meeting and to give us the benefit of her long experience and wide knowledge. The collections made resulted in six new County Records and 49 new records for the little-worked Div. 11. One of the rides on a hillside in the wood proved very prolific, and a number of black-spored species in the *Coprinus-Psathyrella* group were found there, including an albino form of *Coprinus disseminatus*. Three other species from this spot were *Conocybe filaris*, *Pholiota togularis* and *Mycena tortuosa*, which were all new County Records. There were many very large specimens of *Tubaria furfuracea* on the rides (a small fungus usually associated with short grass). A large quantity of the myxomycete *Leocarpus fragilis* was found fruiting on the leaf litter of the forest floor in a recently felled area.

The foray organised by the South Humberside Group was held on 11th October in Cottagers Dale Wood, Limber (by kind permission of the Earl of Yarborough). The ground was dry and cracked, but a recently felled area in the wood was very productive by virtue of the sawdust heaps left by the foresters. Of the 53 species collected, one was a new County Record and 23 others were new for Division 3. An interesting (albeit very smelly) large group of the common stinkhorn, *Phallus impudicus*, caused much photographic activity. Again this year on this estate three of the species dangerous to forestry economics, namely the Honey Fungus (*Armillaria mellea*), Fomes (*Heterobasidion annosus*) and Dry Rot (*Serpula lacrymans*) were found in quantity. As in Welton Woods, many large specimens of *Tubaria furfuracea* were found — this time on the sawdust heaps — together with a number of black-spored species of the *Coprinus-Psathyrella* group.

The writer led a foray for the Grantham Group of the Lincolnshire Trust for Nature Conservation in the Wilsford Heath Quarry on 25th October. The weather was still hot and dry, and only eighteen species were collected. However, eleven of these were Divisional Records for a very little worked division.

Many specimens have been sent in for identification this year by an increasing number of members. Dr. M. Lubin produced a quantity of interesting species and helped in the identification of specimens sent in by other members. Mr. F. Brasier sent in several specimens and gave the writer the location of a group of the Giant Puff-ball, which on investigation produced fifteen large specimens at one time.

Other specimens were sent in by Nurse W. Heath, Miss F. Goodhead, Miss G. Schmid, Mrs. G. N. Parrish and Mrs. D. Adams, and Messrs. G. Posnett,, M. P. Gooseman, V. Knight, C. K. Tallack, I. Osterfield, J. Rowe and Mrs. I. Weston, as well as others not as yet members of the Union. The net result is the addition of numerous new divisional records in particular of the commoner species in little-worked areas.

The Mycology Section has this year been honoured by the general membership insofar as one of its members, Mr. H. J. Houghton, has been elected President. This has been very gratifying for the Section, and it is hoped that the present increased interest in Mycology will not decline after his year as President. The task of recording in the County still presents a monumental task, and it is to be hoped that the present interest will grow.

## SOUTH HUMBERSIDE GROUP FUNGUS FORAY, COTTAGERS DALE WOOD, LIMBER

**11th October, 1970**

**New Record for Lincolnshire**

*Hygrophorus aurantiosplendens* (Haller) P. D. Orton.

**New Records for Division 3**

*Calycella citrina*
*Hypoxylon multiforme*
*Nectria cinnabarina (Conidial)*
*Peziza repanda*
*Xylosphaera hypoxylon*
*Bolbitius vitellinus*
*Boletus elegans*
*Coprinus plicatilis*
*Clitocybe langei*
*Flammulina velutipes*
*Mycena epipterygia*
*Mycena hiemalis*
*Psathyrella gracilis*
*Psathyrella spadicea*
*Psilocybe semilanceata*
*Tubaria furfuracea*
*Auricularia auricula*
*Coriolus hirsutus*
*Lycoperdon pyriforme*
*Phlebia radiata*
*Serpula lacrymans*
*Stereum sanguinolentum*
*Stemonitis fusca*

29 other species already recorded for the division were identified.

## FUNGUS FORAY, WELTON WOODS, WELTON-LE-MARSH [DIV. 11]

**24th October, 1970**

**New Records for Lincolnshire**

*Acia uda* (Fr.) Bourd. and Galz.
*Conocybe filaris* (Fr.) Kühn.
*Conocybe togularis* (Bull. ex Fr.) Kühn.
*Mycena tortuosa* P. D. Orton.
*Phellinus conchatus* (Pers. ex Fr.) Quél.

**New Records for Division 11**

*Erisyphe polygoni DC* on Circaea
*Phyllachora graminis* on Agropyron repens
*Bulgaria inquinans*
*Calycella citrina*
*Cyathicula coronata*
*Diatrype stigma* on Acer
*Lasiosphaera ovina*
*Mollisia cinerea*
*Rhytisma acerinum*
*Collybia confluens*
*Collybia ambusta*
*Collybia fusipes*
*Collybia maculata*
*Coprinus cinereus*
*Crepidotus variabilis*
*Galerina mycenopsis*

**New Records for Division 11 (cotinued)**

*Hypholoma sublateritium*
*Lepiota cristata*
*Marasmius androsaceus*
*Mycena alcalina*
*Mycena vitilis*
*Mycena inclinata*
*Mycena speira*
*Panaeolus rickenii*
*Pluteolus aleuriatus*
*Pluteus salicinus*
*Psathyrella gossypina*
*Psathyrella spadicea*
*Psathyrella conopilea*
*Calocera viscosa*
*Corticium comedens*
*Exidia alba*
*Exidia glandulosa*
*Grifola frondosa*
*Lycoperdon perlatum*
*Poria versispora*
*Pseudotrametes gibbosa*
*Ramaria stricta*
*Stereum rugosum*
*Tremella mesenterica*
*Typhula erythropus*
*Phragmidium violaceum* on Bramble stems
*Puccinia primulae* on Primrose
*Stilbum erythrocephalum*
*Arcyria denudata*
*Badhamia foliicola*
*Comatricha nigra*
*Craterium minutum*
*Leocarpus fragilis*
*Perichaena coritcalis*

34 other species already recorded for the division were identified.

## OTHER NEW RECORDS FOR 1970

**New Records for Lincolnshire**

*Entoloma nidorosum* (Fr.) Quél.
*Inocybe napipes* J. Lange
*Boletus impolitus* Fr.

**New Divisional Records**

| | Div. |
|---|---|
| *Bulgaria inquinans* | 14 |
| *Coryne sarcoides* | 3, 14 |
| *Daldinia concentrica* | 12 |
| *Dasyscyphus virgineus* | 3, 14 |
| *Hypoxylon fragiforme* | 3 |
| *Nectria cinnabarina* | 12 |
| *Rhytisma acerinum* | 14 |
| *Trichoscyphella hahniana* | 3 |
| *Xylosphaera carpophila* | 3 |
| *Xylosphaera polymorpha* | 3, 12 |
| *Amanita rubescens* | 6 |
| *Boletus granulatus* | 5 |
| *Boletus variegatus* | 11, 13 |
| *Boletus erythropus* | 10 |
| *Bolbitius vitellinus* | 11, 12, 14 |
| *Coprinus niveus* | 11 |
| *Coprinus comatus* | 12 |
| *Coprinus micaceus* | 12, 14 |
| *Comphideus roseus* | 5 |
| *Gymnopilus penetrans* | 12 |
| *Gypholoma fasciculare* | 11 |
| *Hebeloma sacchariolens* | 6 |
| *Inocybe lacera* | 6 |
| *Lepiota friesii* | 6 |
| *Lacrymaria velutina* | 8 |
| *Lactarius turpis* | 6 |
| *Lactarius torminosus* | 6 |
| *Marasmius alliaceus* | 12 |
| *Mycena alcalina* | 12 |
| *Omphalina ericetorum* | 6, 12 |
| *Oudimansiella radicata* | 12 |
| *Panaeolus rickenii* | 12 |
| *Panaeolus subbalteatus* | 11 |
| *Panaeolus semiovatus* | 12 |
| *Pholiota squarrosa* | 11, 12 |
| *Pleurotus ostreatus* | 3 |
| *Psathyrella gracilis* | 11, 12 |
| *Clitocybe clavipes* | 12 |
| *Collybia fusipes* | 6 |
| *Russula atropurpurea* | 6 |
| *Russula aeruginea* | 6 |
| *Russula mairei* | 10 |
| *Tricholomopsis platyphylla* | 6 |
| *Puccinia punctiformis* on *Cirsium arvense* | 6 |
| *Puccinia recondita* on *Cynoglossum officinale* | 11 |
| *Uromyces ficariae* on *Ranunculus ficariae* | 6, 7 |
| *Ustilago nuda* on Wheat | 2, 3 |
| *Ustilago nuda* on Barley | 6 |
| *Ustilago violacea* on *Silene alba* | 2, 3 |
| *Ustilago avenae* on *Arrhenatherum elatior* | 5 |
| *Auricularia auricula* | 12 |
| *Acia uda* | 14 |
| *Bovista plumbea* | 6 |
| *Calvatia gigantea* | 10 |
| *Coriolus versicolor* | 3 |
| *Fomes fomentarius* | 10 |
| *Heterobasidion annosum* | 14 |
| *Phallus impudicus* | 12 |
| *Polyporus squamosus* | 12 |
| *Poria versispora* | 14 |
| *Phellinus ferruginosus* | 14 |
| *Polyporus brumalis* | 3 |
| *Stereum hirsutum* | 3 |
| *Stereum sanguinolentum* | 12 |
| *Typhula erythropus* | 14 |
| *Cribraria argillacea* | 14 |
| *Perichaena corticalis* | 3 |
| *Physarum nutans* | 14 |
| *Trichia affinis* | 3 |
| *Trichia varia* | 3 |

# BRYOLOGY AND LICHENOLOGY

M. R. D. Seaward, m.sc.

## Bryophyte Check-List

The following are corrections and additions to *A Bryophyte Check-List for Lincolnshire* (Seaward, M. R. D., 1969, Lincolnshire Natural History Brochure No. 4, Lincoln):

### Mosses

8/5 *Fissidens incurvus* Starke ex Web. & Mohr. — add div. 10
12/7 Substitute '*Ditrichum*' for '*D.*'
29/7 *Dicranum strictum* Schleich. ex Schwaegr. (393) New county record from Woolsthorpe (div. 15), July 1966, M. R. D. Seaward.
31/4 *Campylopus fragilis* (Brid.) B., S. & G. — substitute 'Parsons' for 'Lees'; delete div. 7.
71/2 *Orthodontium lineare* Schwaegr. — add div. 15.
77/25 *Bryum argenteum* var. *lanatum* (P. Beauv.) Hampe — add div. 16.
77/28 *B. erythrocarpum* agg., *B. rubens* Mitt. — add div. 9.
98/5 *Orthotrichum affine* Brid. — substitute '1877, Parsons' for '1878, Lees'; add div. 2.
125/2 *Cratoneuron commutatum* (Hedw.) Roth. — add div. 11.
131/2 *Drepanocladus sendtneri* (Schimp.) Warnst. — substitute '1880, Fowler' for '1959, Seaward' add divs. 2, 4 and 15.
133/1 *Scorpidium scorpioides* (Hedw.) Limpr. — add div. 2.
141/8 *Eurhynchium riparioides* (Hedw.) Rich. — add div. 11.

### Hepatics

8/1 *Marchantia polymorpha* L. — add div. 6.
10/13 Substitute '*R. cavernosa* Hoffm. (418) 1905, Reeves. (7), 14' for '*R. crystallina* L. (418) 1905, Reeves. 7'.
71/1 *Radula complanata* (L.) Dum. — add div. 16.

## Lichen Check-List

Due to the increase in lichenological activity in Lincolnshire over the past five years, it has been necessary to up-date the check-list published in 1966 (*Trans. Lincs. Nat. Un.*, **16**, 153 — 159). During 1970 *A Revised Check-List of Lincolnshire Lichens* and an *Addenda* were published; the former giving 27 new vice-county records and a 40% increase in divisional records, and the latter providing an additional 14 county and 65 divisional records. Copies of these lists are obtainable from the Bryology and Lichenology Secretary (see list of officers for address). Records during the past year have been provided by Miss W. Heath, Miss N. Wallace, Mrs. I. Weston, Mr. D. Blanchard, Mr. B. J. Coppins and Mr. A. E. Wade.

# VERTEBRATE ZOOLOGY

M. Johnson, f.z.s.

## MAMMALIA

The fossil remains of mammals of the Ice Age are occasionally discovered in Lincolnshire sand and gravel pits. Over the last few months I have collected a number of different fossil animal remains from one of these pits in the Bain valley. The commonest finds have been the bones and teeth of *Mammoth*. The leg bones look rather like tree-trunks and each tooth weighs about eight pounds. Other finds are the jaw bones and teeth of a *Woolly Rhinocerous*, the bones and horns of *Ox* and *Bison*, and fragments of red deer and elk antlers.

Thank you for continuing to send in owl pellets and other material for identification. The *Harvest Mouse* is now confirmed in twenty-six 10 Km squares and it is reasonable to assume that this interesting little mammal could be

found in almost any part of the county. A *Harvest Mouse* nest was found on a grass roadverge on Ermine Estate by V. Knight on March 20th. On September 18th I received a dead *Harvest Mouse* from J. Mighell that had been found on Blankney Fen; he has also confirmed their presence on Nocton Fen from remains discovered in owl pellets.

A number of *Badger* setts have been visited during the year and a small badger cub was found dead on a nature reserve in early spring. R. B. Wilkinson reported a *Grey Squirrel* on the Gibraltar Point reserve on September 18th and that others had been seen at the Seacroft end of Skegness. One was seen collecting walnuts and burying them in the flower borders of a house garden at Humberstone Avenue, Waltham by Miss R. Nickerson, and another was reported killed on the road by Lincoln Cathedral.

*Weasels* have been reported from numerous localities. I examined a keeper's gibbet near Wragby which contained 20 weasels, 3 hedgehogs, a grey squirrel and a large number of moles. I should be interested to receive any reports on gibbet contents.

A colony of *Noctule Bats* stayed for a short time in the roof of a new bungalow near Welton and I also examined a colony of *Pipistrelle Bats* in a house-loft at Fulletby. J. A. East, who obtained a *Whiskered Bat* in a mist net at Barlings last year, has sent in records of *Whiskered* and *Long-eared Bats* obtained in the same way from Newball Wood this year. V. Knight reported a *Daubentons Bat* from the Burton Pits having seen it skimming the water surface in its distinctive manner late one evening. The colony of *Noctule Bats* in Sudbrooke Park returned to their beech tree site and they were observed flying during August.

### REPITILIA AND AMPHIBIA

The British Museum have never seen or handled a single specimen of a *Sand Lizard* from Lincolnshire yet the Nature Conservancy have records that suggest they were seen at Huttoft and Sutton-on-Sea in 1946. As there are no published records in *Transactions* I should be very grateful to anyone who can produce evidence or specimens to support their existence in Lincolnshire. During a search for them at Huttoft in June only small numbers of the *Common Lizard* were seen.

*Newts* had returned to spawn in a pond near Fiskerton on March 21st. S. Blatherwick requested help to save *Newts* from a pond being filled in for building purposes in Reepham. Sixty were caught and removed to a pond near Stainfield. The earliest *Frog* spawn was seen on March 27th. On April 4th three ponds in the Benniworth Haven area were found to contain masses of frog spawn and on April 17th *Toads* were spawning in large numbers at the Kirkby Moor Nature Reserve.

---

## ENTOMOLOGY

A. E. Smith, B.Sc.

### Lepidoptera

In many respects there was quite a contrast between 1970 and the previous year when comparing populations of lepidoptera. Although 1970 gave us the second successive dry and sunny summer, many of the common and ubiquitous species of butterflies and moths which built up tremendously in the fine conditions of 1969 were conspicuously down in numbers last year. Perhaps this was a case of diseases and parasites building up progressively but exerting their maximum effect on numbers after a year's timelag, a not unusual type of phenomenon. There were, however, distinctly promising signs with some of

the more local and scarce species found in the county, in that there were cases of increasing numbers and extension of range. Sadly, there were no indications of a return to the county of any of the species which have apparently been lost in the last 25 years or so.

**Butterflies**

The common vannessids had a comparatively poor season. Although the hibernating Small Tortoiseshells and Peacocks overwintered well they did not produce anything like the profusion of numbers which were such a glorious sight in Autumn 1969. The migratory vanessids, the Red Admiral and the Painted Lady, both came in very early in the year but subsequent numbers were well below average. On the other hand, the common browns (Meadow Brown, Gatekeeper, Wall, Ringlet and Small Heath) all had a good year as did the Common Blue — now not all that common in Lincolnshire.

Perhaps the most heartening feature of 1970 was the increase in numbers of some of the scarcer and more local Lincolnshire butterflies. The Brimstone, which is widely distributed as a breeding species in the west half of the county from the Northants' border to the Lincoln area, appears to be expanding its range northwards and was seen in numbers at Laughton last summer after many years absence. Green Hairstreaks were seen in greatly increased numbers on the east coast sand dunes having been at a comparatively low ebb for many years. The Dark Green Fritillary colony at Kirkby Moor appears to be holding its own. This is the only species of Fritillary to be recorded in Lincolnshire for several years. The isolated colony of Grayling near Scunthorpe had an excellent year and the Large Heath was reported as abundant at Crowle Waste.

**Moths**

Although many interesting species of moths were recorded, the general consensus of opinion is that overall moth numbers were down in 1970. The highlight of the season was the recording of a Marsh Moth by Mr. R. E. M. Pilcher at South Thoresby. This local species is almost entirely confined to the fens of Cambs., Hunts. and Suffolk. Outside this area there have been only three or four odd records including one at Theddlethorpe in 1902. It would therefore appear that a small colony may have survived through the years in east Lincolnshire. Several records were received for the migratory Hawk moths — the Convolvulous Hawk and the Humming Bird Hawk.

A list of the more interesting and significant butterflies and moths is given below:

**Butterflies**

769 *Grayling* — Scunthorpe (R.E.M.P.)
773 *Large Heath* — Crowle Waste (R.E.M.P.)
780 *Dark Green Fritillary* — Kirkby Moor (R.E.M.P.)
806 *Green Hairstreak* — Coastal sand dunes (R.E.M.P.)
820 *Brimstone* — Laughton (J.H.D.)

**Moths**

60 *Sycamore* — Spalding (A.E.S.)
61 *Alder* — S. Thoresby (R.E.M.P.)
69 *Light Knotgrass* — Scotton (J.H.D.)
71 *Coronet* — S. Thoresby (R.E.M.P.)
91 *Brown Veined Wainscot* — Alkborough (J.H.D.)
101 *Lesser Spotted Pinion* — S. Thoresby (R.E.M.P.)
111 *Olive* — S. Thoresby (R.E.M.P.)
126 *Marsh Moth* — S. Thoresby (R.E.M.P.)
153 *Butterbur* — S. Thoresby (R.E.M.P.)
210 *Stout Dart* — Alkborough (J.H.D.)
219 *Least Yellow Underwing* — Alkborough (J.H.D.)
245 *Barred Sallow* — S. Thoresby (R.E.M.P.)
261 *Wormwood Shark* — Scunthorpe (J.H.D.)
282 *Large Ranunculus* — Boston (A.E.S.)
388 *Gold Spot* — Alkborough (J.H.D.)
444 *Rosy Wave* — Gibraltar Point (R.E.M.P.)

**Moths (continued)**

453 *Maidens Blush* — Holme Plantation (J.H.D.)
569 *Streamer* — Scotton (J.H.D.)
697 *Bordered Beauty* — Holme Plantation (J.H.D.)
706 *Dusky Thorn* — Alkborough (J.H.D.)
720 *Broad Bordered Bee Hawk* — Kirkby Moor (R.E.M.P.)
721 *Narrow Bordered Bee Hawk* — Kirkby Moor (R.E.M.P.)
722 *Humming Bird Hawk* — Sutton on Sea (G.H.)
738 *Convolvulous Hawk* — Sutton on Sea (G.H.)
1061 *Lappet* — Riseholme (Mrs. I. Weston)
1066 *Narrow Bordered Five Spot Burnet* — Boston (A.E.S.)

## CONCHOLOGY [NON-MARINE]

E. J. Redshaw

Recording for the Census of Non-Marine Molluscs in Lincolnshire, in conjunction with the national census, gained momentum during 1970 though by the end of the year there were still thirty 10 Km squares with less than ten species recorded per square for the post-1950 period. About 50% of these squares were blank areas: 43/86, 43/79, 43/89, 43/98, 44/80, 44/81, 53/03, 53/14, 53/44, 53/15, 53/06, 53/16, 53/17, 53/08, 53/48 and 53/09.

Sampling of ponds, rivers and streams by P. J. Wilson in conjunction with his corixid survey has added considerably to our knowledge of the distribution of aquatic molluscs. To give some idea of the effectiveness of aquatic sampling, out of 16 sites sampled in November, 35 new 10 Km records were obtained for a comparatively small range of species. Similar sampling methods, if applied to each member's garden would provide an equally valuable record of the distribution of some of the common terrestrial molluscs including gardeners' pet aversions, the black slug (*Arion ater* agg.) and common garden snail (*Helix aspersa*).

Already several species maps are beginning to take shape. The zebra mussel (*Dreissena polymorpha*) has been recorded along the R. Witham from Boston Haven to Lincoln and thence along the Fossdyke to Torksey. It may occur in the R. Trent downstream of Torksey but, so far, awaits discovery. The species also occurs throughout the New Ancholme, but in the south of the county the only record for the R. Welland is from Market Deeping. A mollusc with a limited habitat in the county is the large-mouthed valve snail (*Valvata macrostoma*). Its presence is restricted to four 10 Km squares between Bourne and Thorney and appears to be related to species-rich still-water bodies in or closely adjacent to the south Lincolnshire peat belt.

A rarity throughout eastern England, the moss snail *Azeca goodalli*, was found at Welton Low Wood. This species had only been recorded from the county on two previous occasions, near Louth in 1904 and near Bourne in 1909. A species with an apparently restricted distribution is the eccentric snail (*Helicella gigaxi*) which has only been recorded from Tetford and Belchford Hills. A specimen has been taken from the R. Witham at North Witham and must have originated not too far away; however the exact locality is not yet known.

The writer is grateful to Mrs. E. B. Rands (Luton), R. W. Morrell (Nottingham) and P. J. Wilson for supplying records and specimens, and to Dr. M. P. Kerney (Conch. Soc. Non-Marine Recorder) for identifying critical species.

The following species recorded during the year were new vice county records:

| | | |
|---|---|---|
| *Assiminea grayana* Fleming | VC 53 | (E.J.R.) Saracens Head, Whaplode |
| *Hygromia liberta* (Westerlund) | VC 53 | (E.J.R.) Surfleet Lows N.R. |
| *Helicetta caperata* (Montagu) | VC 53 | (E.J.R.) Holbeach Marsh, old sea wall |
| *Helicetta gigaxi* (L. Pfeiffer) | VC 53 | (P. J. Wilson) North Witham |
| *Vitrea contracta* (Westerlund) | VC 53 | (E.J.R.) Holbeach Marsh, old sea wall |
| *Mitax sowerbyi* (Fe'russac) confirmed | VC 53 | (E.J.R.) garden in Spalding |
| *Anodonta anatina* (L.) | VC 53 | (P. J. Wilson) North Witham |

## REPORT OF THE HON: GENERAL SECRETARY, 1970-71

The Union continues to play an important role as a publisher. It is worth noting that over £650 worth of publications have been sold in the last five years. These include *Birds of Lincolnshire* (1953) and past *Transactions* (£220) and *Nature Conservation in Lincolnshire* (£275). Profit on *Lincolnshire Soils* has almost covered any loss on the *Bryophyte Check List*, and offprints of *Pleistocene Events in Lincolnshire* have already made 100% profit. The *Supplement to the Birds of Lincolnshire* 1954-1968, published last year as Natural History Brochure No. 5, has not sold as well as expected so far, but should fill a steady demand.

Seven Field Meetings were attended by 249 members and there was also a mid-week meeting and a successful Junior weekend at Gibraltar Point. The winter programme was successful, although less extensive, and included a particularly useful half-day course at Horncastle — Geology for Beginners — attended by 35 members. The South Humberside Group continued to arrange a full and active programme of indoor and field meetings.

The Executive Committee met five times during the year. Arising out of discussion with the Forestry Commission, the Lincolnshire Trust for Nature Conservation now has an agreement with the Lincoln District of the Commission which will help to safeguard areas of special interest within their forests. Insurance cover has been taken out for meetings, particularly field meetings, and the Executive has agreed to a new financial arrangement for the South Humberside Group which should allow an expansion of activities. not least involving young people. Support has also been expressed for the Lincolnshire Branch C.P.R.E. in its efforts to combat roadside verge removal. There has been virtually no response to the request for volunteers to help in surveys for the Trust. This is particularly disappointing as the Union is well placed to help with conservation in this way.

This year completes five years for me as Hon. General Secretary and Editor of Publications. I am pleased to continue with the latter, but have been compelled to resign as Hon. General Secretary in view of the almost impossible burden of being also Hon. Secretary of the Lincolnshire Trust for Nature Conservation. I am grateful for the help and support of members over the five years and wish the new Hon. General Secretary, John Rowe, every success.

# STATEMENT OF ACCOUNT

## from January 1st to December 31st 1971

### RECEIPTS

| | | | 1970 £ s d | 1969 £ s d |
|---|---|---|---|---|
| To Cash at Midland Bank, Lincoln, 1st January, 1970 | | | 172 8 4 | 147 16 4 |
| ,, Subscriptions | | | 406 15 0 | 377 5 0 |
| ,, Donations | | | 24 13 0 | 40 1 0 |
| ,, Sales: Picture by T. Barnatt | | | 5 5 0 | |
| Trust publication "Gibraltar Point Birds" | | | 11 8 0 | |
| L.N.U. Publications: | | | | |
| Lincs. Soils | 33 18 10 | | | |
| Bryophyte Check List | 2 14 0 | | | |
| Transactions | 61 14 0 | | | |
| Pleistocene Events | 7 6 0 | | | |
| Birds of Lincs. and Bird Reports | 29 12 6 | | | |
| Supplement to Birds of Lincs. | 56 15 6 | | | |
| | | | 192 0 10 | 150 9 0 |
| A. E. Smith's Presidential Address | | | 198 9 6 | 77 9 0 |
| Offprints Presidential Address (A. D. Townsend) | | | – – – | 7 5 0 |
| Offprints Pleistocene Events | | | – – – | 11 10 0 |
| ,, Loan from Lincolnshire Trust for Nature Conservation Ltd. for publication of A. E. Smith's Presidential Address | | | – – – | 200 0 0 |
| | | | £1010 19 8 | £1011 15 4 |

Midland Bank Deposit Account (Money for publication of the Flora of Lincolnshire) £723 17 0 £687 10 6

### EXPENSES

| | 1970 £ s d | 1969 £ s d |
|---|---|---|
| By Printing: | | |
| 430 Transactions Vol. XVII, No. 2, Pt. 2 (Bird Report) | 77 0 0 | 89 10 0 |
| 500 Supplement to the Birds of Lincs. | 165 10 0 | – – – |
| 400 Transactions Vol. XVII, No. 2, Pt. 1 | – – – | 151 15 0 |
| 1000 Lincolnshire Soils | – – – | 50 10 0 |
| 250 Bryophyte Check List | – – – | 53 0 0 |
| Pleistocene Events (offprints) | – – – | 11 10 0 |
| ,, Subscriptions to Societies | 11 6 0 | 11 6 0 |
| ,, Stationery and printing | 11 3 0 | 21 15 3 |
| ,, Secretarial Expenses: Mrs. Adams; Messrs. Posnett, Robinson | 18 3 4 | 34 2 9 |
| ,, Hire of Rooms | 10 16 7 | 23 5 11 |
| ,, Lecturers' Expenses | 1 10 0 | 15 0 |
| ,, Duplicating and posting of notices | 96 12 9 | 113 19 7 |
| ,, South Humberside Group | 16 1 11 | 10 0 0 |
| ,, Purchase copies of "Outdoor Studies Code" | – – – | 2 0 0 |
| ,, Forestry Commission Charges | 1 0 0 | 2 0 0 |
| ,, Income Tax on Defence Bonds | – – – | 10 12 6 |
| ,, Printing A. E. Smith's Presidential Address | – – – | 246 5 0 |
| ,, Expenses in distribution of above | – – – | 5 0 0 |
| ,, Repayment of loan for above | 200 0 0 | – – – |
| ,, Purchase of offprints from A. D. Townsend | 1 8 0 | – – – |
| ,, Payment to T. Barnatt (sale of picture) | 4 14 6 | – – – |
| ,, Insurance — for Field Meetings | 3 0 0 | – – – |
| ,, Advertisements of publications | 2 18 6 | – – – |
| | 2 2 0 | – – – |
| ,, Bank charges and cheque books | 1 15 0 | 2 0 0 |
| ,, Cash at Bank, 31st December 1970 | 382 18 1 | 172 8 4 |
| | £1010 19 8 | £1011 15 4 |

Audited and found correct, 2nd February, 1971.
ROBERT WITHERS, *Hon. Auditor*

## CONTENTS


| | | *Page* |
|---|---|---|
| PRESIDENTIAL ADDRESS : A BEGINNER'S GUIDE TO THE MYXOMYCETES (with special reference to Lincolnshire) | *H. J. Houghton* | 197 |
| PERIGLACIAL GULLS IN THE UPPER WITHAM VALLEY | *P. J. Muskett, M.A.* | 210 |
| THE CONTRIBUTION OF WALTER J. WOOD (1862-1939) TO LINCOLNSHIRE MICROSCOPICAL WORK | *M. R. D. Seaward, M.Sc.* | 216 |
| BENINGTON MARSH 1970 | *P. J. Wilson* | 219 |
| SECTION REPORTS : | | |
| Botany | *Miss E. J. Gibbons, F.L.S.* | 222 |
| Thorne Waste 1970 | *Mrs. I. Weston, B.Sc.* | 222 |
| Mycology | *H. J. Houghton* | 223 |
| Bryology and Lichenology | *M. R. D. Seaward, M.Sc.* | 227 |
| Vertebrate Zoology | *M. Johnson, F.Z.S.* | 227 |
| Entomology | *A. E. Smith, B.Sc.* | 228 |
| Conchology (Non-Marine) | *E. J. Redshaw* | 230 |
| REPORT OF THE HON. GENERAL SECRETARY, 1970-71 | | 231 |
| STATEMENT OF ACCOUNT | | 232 |



KEYWORTH & FRY LTD., 117-121 PORTLAND STREET
LINCOLN